

**Black & Veatch Special Projects Corp.  
Site Health and Safety Plan**

**American Chemical Service, Inc. Site  
Remedial Action Oversight**

Prepared by:

Nicole T. Didyk  
Nicole T. Didyk  
(Project Engineer)

Date:

Nov 1, 2005

Reviewed by:

Larry M. Campbell  
Larry M. Campbell  
(Project Manager)

Date:

12 Dec 05

Approved by:

Jack Schill  
Jack Schill, CIH, CSP  
(BVSPC HSM)

Date:

12 DEC 2005

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# **Site Health and Safety Plan**

## **American Chemical Service, Inc. Site**

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## Appendices

Appendix A	Task Health and Safety Plan A
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## Acronyms and Abbreviations

Abs	Skin absorption
ACGIH	American Conference of Governmental Industrial Hygienists
ACP	Access control point
ACS	American Chemical Service, Inc.
ANSI	American National Standards Institute
APR	Air-purifying respirator
ASR	Atmosphere-supplying respirator
bls	Below land surface
BTEX	Benzene, toluene, ethylbenzene and xylene
BVSPC	Black & Veatch Special Projects Corp.
cPAHs	Carcinogenic polynuclear aromatic hydrocarbons
CAS	Chemical Abstracts Service
CFR	Code of Federal Regulations
CGA	Compressed Gas Association
CNS	Central nervous system
CO	Carbon monoxide
CO <sub>2</sub>	Carbon dioxide
COC	Chemical of concern
Con	Skin and/or eye contact
CPR	Cardio-pulmonary resuscitation
CRC	Contamination reduction corridor
CVS	Cardiovascular system
db	Decibel
DOT	Department of Transportation
ESLI	End-of-service-life indicator
FID	Flame ionization detector
GI Tract	Gastrointestinal tract
GWTP	Groundwater Treatment Plant
HASP	Health and safety plan
HSM	Health and safety manager
IDLH	Immediately dangerous to life or health
Ing	Ingestion
Inh	Inhalation



K-P	Kapica-Pazmey
LEL	Lower explosive limit
mg/kg	Milligrams per kilogram
MGP	Manufactured gas plant
MSDS	Material safety data sheet
MSHA	Mine Safety and Health Administration
NE	No evidence could be found for the existence of an IDLH
NIOSH	National Institute for Occupational Safety and Health
NRC	Nuclear Regulatory Commission
OSHA	Occupational Safety and Health Administration
OVA	Organic vapor analyzer
PAH	Polynuclear aromatic hydrocarbon
PCH	Polynuclear aromatic hydrocarbon, non-carcinogenic
PCB	Polychlorinated biphenyl
PEL	Permissible exposure limit
PID	Photo ionization detector
PLHCP	Physician or licensed health care professional
PM	Project manager
PNS	Peripheral nervous system
PPE	Personal protective equipment
ppm	Parts per million
PRP	Potentially responsible party
PVC	Polyvinyl chloride
QLFT	Qualitative fit test
QNFT	Quantitative fit test
RA	Remedial action
RBC	Red blood cell
RCRA	Resource Conservation and Recovery Act
REL	Recommended exposure limits
RI	Remedial investigation
ROD	Record of Decision
SAR	Supplied-air respirator
SARA	Superfund Amendments and Reauthorization Act
SCBA	Self-contained breathing apparatus
SM	Site manager

SSC	Site safety coordinator
SVE	Soil vapor extraction
skin	Danger of cutaneous absorption
TLV	Threshold limit value
TWA	Time-weighted average exposure concentration for normal 8-hour (TLV, PEL) or up to a 10-hour (REL) workday and 40-hour workweek
USEPA	United States Environmental Protection Agency
UST	Underground storage tank
VDS	Vehicle decontamination station
VOC	Volatile organic compound

## **1.0 Introduction**

### **1.1 Purpose**

This Site Health and Safety Plan (HASP) will establish the site specific health and safety guidelines and procedures for activities at the American Chemical Service, Inc. (ACS) site. The HASP will be based on existing data and site reconnaissance and will be in accordance with Occupational Safety and Health Administration (OSHA) regulations. The HASP will be approved by the Black & Veatch Special Projects Corp. (BVSPC) health and safety manager (HSM) or designee.

### **1.2 Scope**

Specific information or procedures that are applicable to all operations and tasks at the site are included in Sections 1.0 through 12.0 of the HASP. These procedures are applicable to all site activities unless stated otherwise in Appendix A, which addresses specific tasks and operations to be performed at the ACS site and details the hazards and control measures. Appendix A will be referred to as the task-specific health and safety plan (Task HASP).

### **1.3 Compliance with HASP**

Consistent with the contents of this Site HASP, work will be conducted in a safe and environmentally acceptable manner, and all BVSPC personnel and subcontractors contractually under this Site HASP shall be required to comply with the health and safety requirements specified herein. All field personnel under this plan are required to read and familiarize themselves with the contents of this Site HASP and the associated Task HASPs. Field personnel will document this competency through the entry of a signature and date as specified in the Certification Section (Section 11.0) in this Site HASP and Task HASPs related to the work being performed. Subcontractors who are not contractually under this Site HASP are responsible to develop and implement a Site HASP that will interface with this Site HASP.

## **2.0 Site Background**

### **2.1 Facility Description**

The ACS site is located in Griffith, Indiana. Developed land around the site is used for single family residences and industrial purposes. The site is located at and near 420 South Colfax Avenue, Griffith, Indiana, and includes the 19-acre ACS property, the 2-acre Pazmey Corporation property [formerly owned by Kapica Drum, Inc., now owned by Darija Djurovic, and identified hereinafter as the Kapica-Pazmey (K-P) area], and the 15-acre inactive portion of the Griffith Municipal Landfill.

### **2.2 Status**

The ACS facility and the Griffith Municipal Landfill are active. The Pazmey Corporation property (formerly Kapica Drum, Inc., and now owned by Darija Djurovic) is inactive.

### **2.3 Summary of Previous Site Activities**

ACS began operations in 1955 as a solvent recovery firm. ACS was later involved in chemical manufacturing and operated for a limited time as a Resource Conservation and Recovery Act (RCRA) facility. Several areas of the property were used for disposal of hazardous wastes. In 1990, ACS ceased solvent reclaiming activities after losing interim status under RCRA. Today, ACS operates as a chemical manufacturer.

The USEPA completed a remedial investigation at the site and issued a Record of Decision (ROD) for site cleanup in September 1992. Later, USEPA issued an amended ROD (1999) to change the selected full treatment remedy to a containment and treatment remedy. Subsequently, USEPA reached agreement with the potentially responsible parties (PRPs) who privately have undertaken the cleanup at the ACS site. As obligated by the Consent Decree, the PRPs have or will perform the following tasks:

- Excavated 1,698 drums and drum carcasses from the onsite containment area; characterized drum contents and shipped offsite 234 drums and 380 cubic yards (c.y.) of drum carcass debris for incineration; and relocated 2,500 c.y. of spilled drum contents and contaminated soils to backfill the onsite fire water pond.
- Constructed interim and final covers over the buried waste in both the offsite and K-P areas and over the Still Bottoms Pond Area (including the backfilled fire water pond).

- Implemented insitu soil vapor extraction (SVE) of volatile organic compounds (VOCs) in the buried waste in the onsite containment area, the offsite containment area, and the K-P area.
- Constructed a groundwater extraction and treatment system capable of dewatering the areas of the site targeted for SVE and also containing the offsite groundwater contaminant plume. Treated water is being discharged to the wetlands.
- Excavated soil/sediment containing greater than 1 ppm polychlorinated biphenyls (PCBs) from the wetlands and placed 1,100 c.y. in the fire water pond and an additional 3,800 c.y. in the offsite area beneath the clay covers. Since none of the excavated soil/sediment contained PCBs at concentrations greater than 50 ppm, all could be reused onsite without requiring offsite disposal.
- Installed a subsurface separation barrier (slurry) wall between the offsite and onsite containment areas to divide the site in half (to aid in dewatering the areas to allow for operation of the SVE).
- Maintained the previously installed subsurface barrier wall around the ACS site to minimize the movement of site contaminants offsite and to impede groundwater flow into the site; pumped groundwater from within the area surrounded by the barrier wall to maintain an inward groundwater gradient across the wall. Onsite contaminant source areas were covered with a soil and asphalt cap, and offsite contaminant source areas were covered with a soil cap and a flexible membrane liner to reduce infiltration.
- Implemented long-term groundwater monitoring, including private well sampling. Impacted wells would be subjected to closure or the owner would receive groundwater use advisories.
- Implemented chemical oxidation injection technology treatments in the source area for the offsite contaminated south area groundwater plume outside the barrier wall.

## 2.4 Current and Potential Future Site Activities

Current site activities are as follows:

- Monitoring well and piezometer water level measurements during groundwater sampling.
- Chemical oxidation injection technology for testing the source plume.
- Sampling of vapor from the insitu SVE system.

Potential future site activity includes the following:

- Operate/maintain GWTP - collect and test effluent samples.
- Operate SVE systems - collect and test influent and effluent sample.
- Measure water levels in monitoring wells, piezometers, and staff gages.
- Collect and analyze water samples.
- Conduct chemical oxidation inspection and subsequent sampling.
- Conduct lower aquifer investigation and groundwater pump test.
- Install wells needed to remediate lower aquifer contaminants.
- Conduct additional chemical oxidation injections.
- Collect product from SVE wells.
- Upgrade onsite SVE system.

## 2.5 Nature and Extent of Hazardous Materials

Investigation and remedial action activities have been conducted continually at the ACS site since 1989. The investigation activities have indicated the presence of contaminated groundwater, soil, and other sources. Contamination in the surface soils (i.e., primarily PCBs) was observed in the area of the site west of the fire pond (wetlands). Contamination in the surface and subsurface soils (including drums and other source materials) has been observed in the onsite containment area, the offsite containment area, and the still bottoms pond area.

The baseline risk assessment identified the following chemicals of concern in groundwater.

- |                             |                                    |
|-----------------------------|------------------------------------|
| ● Chloromethane             | ● Bis(2-chloroethyl)ether          |
| ● Vinyl Chloride            | ● 1,4-Dichlorobenzene              |
| ● Methylene Chloride        | ● 4-Methylphenol                   |
| ● Acetone                   | ● Isophorone                       |
| ● 1,1-Dichloroethane        | ● Pentachlorophenol                |
| ● 1,2-Dichloroethene (cis-) | ● Bis(2-ethylhexyl)phthalate       |
| ● 2-Butanone                | ● Polychlorinated Biphenyls (PCBs) |
| ● Trichloroethene           | ● Arsenic                          |

- Benzene
- 4-Methyl-2-Pentanone
- Tetrachloroethene
- Ethylbenzene
- Beryllium
- Manganese
- Thallium

However, based on the USEPA approved document titled "Revised Long-Term Groundwater Monitoring Plan, ACS, Inc NPL Site, Griffith, Indiana," dated September 20, 2002, the only chemicals of concern in groundwater are the following:

- Benzene
- Chloroethane
- Bis(2-chloroethyl)ether

The baseline risk assessment identified the following chemicals of concern in soil.

- Chloroethane
- Vinyl Chloride
- Methylene Chloride
- Acetone
- 1,2-Dichloroethane
- 1,2-Dichloroethene (cis-)
- 2-Butanone
- Trichloroethene
- Benzene
- 4-Methyl-2-Pentanone
- Tetrachloroethene
- Styrene
- 1,1-Dichloroethene
- Carbon Tetrachloride
- Chloroform
- 1,2-Dichloropropane
- Toluene
- 1,1,1-Trichloroethane
- 1,1,2,2-Tetrachloroethane
- Chlorobenzene
- Xylene
- Antimony
- Cadmium
- Chromium
- Lead
- Bis(2-chloroethyl)ether
- 1,4-Dichlorobenzene
- cPAHs
- Isophorone
- Pentachlorophenol
- Bis(2-ethylhexyl)phthalate
- PCBs
- 2,4-Dinitrotoluene
- Hexachlorobutadiene
- Hexachlorobenzene
- n-Nitrosodiphenylamine
- 2,6-Dinitrotoluene
- Naphthalene
- Di-n-butylphthalate
- 1,2,4-Trichlorobenzene
- Aldrin
- 4,4,4-DDD
- 4,4,4-DDE
- 4,4,4-DDT
- Heptachlor Epoxide
- Endosulfan I
- Alpha-BHC
- Gamma-BHC
- Beta-BHC

## **3.0 Hazard Assessment**

### **3.1 Chemicals of Concern**

Chemicals of concern (COCs) commonly found on the American Chemical Service, Inc. site are listed in Attachment 2. The table lists the allowable exposure limits for the chemicals, signs and symptoms of exposure, dermal absorption hazards, carcinogenicity, immediately dangerous to life and health (IDLH) values, health hazards, physical hazards, Chemical Abstracts Service (CAS) registry numbers, and physical characteristics. Task-specific information related to the chemicals of concern are listed in the appropriate Task HASP.

When COC concentrations exceed 1% (or 0.1% for a carcinogen), a Material Safety Data Sheet (MSDS) will be provided in Attachment 3, in accordance with Section 8.6.4. (Hazard Communication) of the Site HASP. The MSDSs may not be from the specific manufacturer, distributor, or potentially responsible parties that deposited the COCs. Although these are written by a specific manufacturer, they are not meant in any way to suggest that the waste products or contamination on the site come from that particular manufacturer. They are intended to be used solely as an approximation for the waste product to provide safety and health hazard information, including symptoms of exposure, first-aid procedures, and spill control measures.



## **4.0 Personnel Qualifications**

### **4.1 Training Requirements**

All personnel who will be engaged in hazardous waste operations must present to the site safety coordinator (SSC) a certificate of completion for an initial 40-hour hazardous waste operations training course and the most recent certificate of completion for an 8-hour refresher course. The course must have been completed within the 12 months of the individual being onsite performing hazardous waste operations. The training must comply with OSHA regulations found at 29 Code of Federal Regulations (CFR) 1910.120(e). The certification must be presented to the SSC before site activities begin.

All personnel must complete a minimum of 3 days on-the-job training under the direct supervision of a qualified SSC or site supervisor before they are qualified to work at a hazardous waste site unsupervised.

Consistent with OSHA 29 CFR 1910.120 paragraph (e)(4), individuals serving in a supervisory role, such as the field team leader or SSC, require an additional 8 hours of training. BVSPC individuals functioning in a SSC capacity shall also have at least 6 days of experience at the level of protection planned for in this Site HASP. A SSC qualified at a given level of protection is also qualified as a SSC at a lesser level of protection.

At least two people will be trained and currently certified in first aid and adult cardiopulmonary resuscitation (CPR).

Personnel who use air supplied respirators (ASRs) must provide the HSM written certification that they 1) have been trained in the proper use, inspection, emergency use, and limitations of the equipment by a competent person, 2) have been successfully fit tested with the ASR. The training and fit testing must be current within 12 months prior to the use of the equipment.

Personnel who participate in permitted confined space entry, radiation work, asbestos work, or work involving lockout/tagout of energy sources must provide the HSM written certification that they have been trained in accordance with the applicable OSHA regulations before performing such work.

Personnel who use health and safety monitoring equipment other than the type and model provided by the BVSPC equipment center must provide written certification to the HSM that they have been trained in the use, maintenance, calibration, and operation of the equipment by a competent person before using the equipment.

#### **4.1.1 Safety Meetings**

Safety meetings with all team members will be conducted prior to initiating any site activity. In addition, periodic briefings will be held throughout the project, especially when unsafe practices are noted or a change in site conditions require modifications of the HASP. Periodic meetings will be held at least weekly. Similar meetings will be held with individuals who later become a part of the field team before they take part in site activities.

The Safety Meeting Checklist in Attachment 4 provides a guide of topics to be covered during the initial briefing and may be covered during periodic meetings. The Safety Meeting Checklist will be used to document the safety meeting topics discussed and attendance.

The SSC is responsible for conducting and documenting the safety meetings.

#### **4.2 Medical Surveillance Program**

All personnel who participate in hazardous waste site activities will be enrolled in a medical monitoring program prior to initiating site activities. The medical monitoring program will consist of an initial baseline examination, periodic monitoring examinations, and an exit examination.

All personnel who will be engaged in hazardous waste operations must present to the SSC a certificate of completion of a comprehensive medical monitoring examination. The medical examination must have been completed within 12 months prior to the beginning of site activities.

As a minimum, the medical monitoring examination will include the elements listed in Attachment 5.

Site specific medical monitoring examinations or tests may be required to augment the standard examinations. Any additional examinations or tests required will be listed under the Site Specific Medical Monitoring Requirements section of the Task HASP.

Personnel who have the potential to wear respirators must present to the SSC a written documentation that a physician has determined that they are physically able to perform the work and use the respirator.

## 5.0 Personal Protective Equipment

### 5.1 General

All site activities require the following personal protective equipment (PPE) to be worn as a minimum:

- Safety glasses with sideshields meeting the requirements and specifications of the current American National Standards Institute (ANSI) Z87 standard.
- Steel-toed boots meeting the requirements and specifications for Class 75 occupational foot protection of the current ANSI Z41 standard.

The following PPE will be provided, used, and maintained in a sanitary and reliable condition whenever it is necessary because hazards of processes or environment, chemical hazards, radiological hazards, or mechanical irritants are encountered in a manner capable of causing injury or impairment in the function of any part of the body through absorption, inhalation, or physical contact:

- Suitable eye protection.
- Head protection.
- Extremities protection.
- Protective clothing.
- Shields and barriers.
- Face protection.
- Respiratory protection.
- Hearing protection.

### 5.2 Chemical Protective Equipment

#### 5.2.1 Levels of Protection

Personnel will wear chemical protective equipment when activities involve known or suspected atmospheric contamination; when airborne vapors, gases, or particulate may be generated by site activities; or when direct contact with skin-affecting substances may occur.

The specific level of protection and necessary components for each have been divided into five categories, according to the degrees of protection afforded:

- Level D. Will be worn as a basic work uniform and not in any area with respiratory or skin hazards. It provides minimal protection against chemical hazards.
- Modified Level D. Will be worn as a basic work uniform for work where incidental contact with contaminated materials is possible. It provides

protection against chemical hazards to the skin and minimizes contamination of the work uniform.

- Level C. Will be worn when the criteria for using air-purifying respirators are met and a lesser level of skin protection is needed.
- Level B. Will be worn when the highest level of respiratory protection is needed, but a lesser level of skin protection is required. Level B is the primary level of choice when encountering unknown environments.
- Level A. Will be worn when the highest level of respiratory, skin, and eye protection is needed.

**Note**: BVSPC personnel are **NOT** authorized to work at Level A without additional training and written approval from the BVSPC HSM.

### **5.2.2 Chemical Ensembles**

The following are the standard chemical protective equipment to be used for all hazardous waste operations. Combinations of chemical protective equipment other than those described for Levels D, modified D, C, and B protection may be more appropriate and may be used to provide the proper level of protection. Deviations from this standard must be addressed in the Task HASP.

- Level D PPE
  - Long sleeved work uniform or equivalent.
  - Boots with steel toe and steel shank.
  - Safety glasses with sideshields.
  - Gloves, chemical-resistant (11-mil-thick nitrile) when handling contaminated materials.
  - Hardhat.
- Modified Level D PPE
  - Tyvek coveralls with long sleeves or equivalent.
  - Boots with steel toe and steel shank.
  - Safety glasses with sideshields.
  - Outer boot covers, chemical-resistant, disposable.
  - Outer gloves, chemical-resistant (11-mil-thick nitrile).
  - Inner gloves, chemical-resistant (4-mil-thick nitrile).
  - Hardhat.

- Level C PPE
  - Air-purifying respirator approved by Mine Safety and Health Administration (MSHA) and/or National Institute of Occupational Safety and Health (NIOSH), with an organic vapor/acid gas/high efficiency particulate filter cartridge.
  - Chemical-resistant one- or two-piece suit (Saranex/Tyvek) with double bonded seams.
  - Long cotton underwear (optional).
  - Outer gloves, chemical-resistant (11-mil-thick nitrile).
  - Inner gloves, chemical-resistant (4-mil-thick nitrile or polyvinyl chloride [PVC]).
  - Boots, chemical-resistant with steel toe and steel shank.
  - Outer boot covers, chemical-resistant, disposable.
  - Faceshield (optional).
  - Hardhat.
- Level B PPE
  - Supplied-air respirator (MSHA/NIOSH approved). Respirators may be positive pressure-demand, self-contained breathing apparatus (SCBA) or positive pressure-demand airline respirator (with escape bottle for IDLH or potential for IDLH atmosphere).
  - Hooded, chemical-resistant, one-piece suit (Saranex/Tyvek) with double bonded seams.
  - Long cotton underwear (optional).
  - Outer gloves, chemical-resistant (11-mil-thick nitrile).
  - Inner gloves, chemical-resistant (4-mil-thick nitrile or PVC).
  - Boots, chemical-resistant with steel toe and steel shank.
  - Outer boot covers, chemical-resistant, disposable.
  - Faceshield (optional).
  - Hardhat.
- Level A PPE
  - Not applicable for BVSPC personnel.

### **5.3 Hazards and Protection Level**

The types of hazards for which Levels D, modified D, C, and B protection are appropriate are described below.

#### **5.3.1 Level D**

Level D protection will be used when the following conditions exist:

- The atmosphere contains no known hazard.
- Work functions preclude splashes, immersion, or potential for unexpected inhalation of or contact with hazardous levels of any chemicals.

#### **5.3.2 Modified Level D**

Modified level D protection will be used when the following conditions exist:

- The atmosphere contains no known hazard.
- Work functions pose minimal risk of exposure to skin or contact with hazardous levels of any chemicals.

#### **5.3.3 Level C**

Level C protection will be used when the following conditions exist:

- The atmospheric contaminants, liquid splashes, or other direct contact will not adversely affect or be absorbed through any exposed skin.
- The types of air contaminants have been identified, the concentrations have been measured, and an air-purifying respirator is available that can remove the contaminants.
- All criteria for the use of air-purifying respirators are met.

#### **5.3.4 Level B**

Level B protection will be used when the following conditions exist:

- The type and atmospheric concentration of substances have been identified and require a high level of respiratory protection, but less skin protection is required.
- The atmosphere contains less than 19.5 percent oxygen.
- The presence of incompletely identified vapors or gases is indicated by a direct reading organic vapor detection instrument, but vapors and gases are not suspected of containing high levels of chemicals harmful to skin or capable of being absorbed through the skin.

NOTE: This involves atmospheres with IDLH concentrations of specific substances that present severe inhalation hazards and that do not represent a severe skin hazard, or that do not meet the criteria for use of air-purifying respirators.

#### **5.4 Reassessment of Protection Level**

The level of protection provided by PPE will be upgraded or downgraded based upon a change in site conditions or findings of investigations. When a significant change occurs, the hazards will be reassessed. The following are some indicators of the need for reassessment:

- Airborne concentrations of chemicals or physical hazards exceed action levels.
- Commencement of a new work phase, such as the start of drum sampling or work that begins on a different portion of the site.
- Change in job tasks during a work phase.
- Change of weather.
- When temperature extremes or individual medical considerations limit the effectiveness of PPE.
- Contaminants other than those previously identified are encountered.
- Change in ambient levels of contaminants.
- Change in work scope affects the degree of contact with contaminants.
- Detection of contamination by instrument, odor, or sight.

#### **5.5 Inspection of PPE**

The user of the PPE is responsible for inspecting the PPE immediately prior to each use and after each incident that could damage the PPE. The PPE will not be used if the user is not familiar with its limitations.

The user's buddy is responsible for periodically checking on the proper use of the protective equipment while in use, as discussed in Subsection 7.3 Buddy System.

#### **5.6 Respiratory Protection**

##### **5.6.1 General**

In the control of those occupational diseases caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smokes, sprays, or vapors, the primary objective shall be to prevent atmospheric contamination. This shall be accomplished as far as feasible by accepted engineering control measures (for example, enclosure or confinement of the

operation, general and local ventilation, and substitution of less toxic materials). When effective engineering controls are not feasible, or while they are being instituted, appropriate respirators shall be used in accordance with OSHA Respiratory Protection Standard (29CFR1910.134).

The Site Safety Coordinator (SSC) is responsible for implementing the respiratory protection program, overseeing the day-to-day implementation of the program, and conducting an evaluation of the work site program effectiveness. The worksite program must be administered by a worksite program administrator that is qualified by appropriate training or experience that is commensurate with the complexity of the worksite respiratory protection program. The worksite program administrator is responsible for overseeing the day-to-day operation of the respiratory protection program at the worksite and to conduct evaluations of the worksite program effectiveness.

The worksite specific procedures will be updated as necessary to reflect changes in workplace conditions that affect respirator use.

### **5.6.2 Respirator Selection**

The SSC must review the use of any respirator used at the site. Respirators must be certified by the National Institute of Occupational Safety and Health (NIOSH). The use of the respirator shall be in compliance with the manufacturer's instructions and conditions of its NIOSH certification.

The "Respirator Selection and Hazard Assessment" form (Figure A6-1 in Attachment 6) will be completed for each use of respirator protection. Documentation of compliance with 29 CFR 1910.134 is an acceptable substitute for the above form. A copy of the "Respirator Selection and Hazard Assessment" form, or any substitute, and any supporting documentation will be provided to the SSC before the respirator is put into use.

A sufficient number of respirator models and sizes shall be available so that the respirator is acceptable to, and correctly fits, the user.

**5.6.2.1 Respirators for Immediately Dangerous to Life and Health (IDLH) Atmospheres.** For IDLH atmospheres, one of the following respirators must be provided and used in accordance with instructions:

- (1) A full facepiece, pressure-demand, self-contained breathing apparatus (SCBA) with a minimum service life of 30 minutes.
- (2) A combination full facepiece, pressure-demand, supplied-air respirator (SAR) with auxiliary self-contained air supply.



Respirators provided only for escape from IDLH atmospheres shall be NIOSH-certified for escape from the atmosphere in which they will be used. All oxygen-deficient atmospheres shall be considered IDLH.

**5.6.2.2 Respirators For Non-IDLH Atmospheres.** Respirators shall be provided that are adequate to protect the health of the employee and ensure compliance with all other Occupational Safety and Health Administration (OSHA) statutory and regulatory requirements, under routine and reasonably foreseeable emergency situations.

The respirator selected shall be appropriate for the chemical state and physical form of the contaminant. For protection against gases and vapors, one of the following respirators shall be provided:

- (1) Atmosphere-supplying respirator (ASR), or
- (2) Air-purifying respirator (APR).

Air-purifying respirators against gases and vapors are permitted only when:

- (a) The respirator is equipped with an end-of-service-life indicator (ESLI) certified by NIOSH for the contaminant, or
- (b) If there is no appropriate ESLI, a change schedule for canisters and cartridges based on objective information or data that will ensure that canisters and cartridges are changed before the end of their service life. The objective information must be documented on the "Respirator Selection and Hazard Assessment" form (Figure A6-1).

For protection against particulates, one of the following respirators shall be provided:

- (1) Atmosphere-supplying respirator;
- (2) Air-purifying respirator equipped with a filter certified for particulates by NIOSH under 42 CFR Part 84.

**5.6.2.3 Assigned Protection Values.** The assigned protection values established by NIOSH and listed in Table 5-1 are applicable, unless OSHA has made a different determination in a substance specific standard.

In order to determine the protection factors for respirators, the worksite respirator program administrator is responsible for determining and documenting the measured or estimated airborne concentration of each contamination. As shown in the following equation, this value is divided by the allowable exposure limit or guideline to obtain a hazard ratio:

$$\Sigma (\text{Airborne Concentration} \div \text{Allowable Exposure Limits}) = \text{Hazard Ratio}$$

Table 5-1 Assigned Protection Values			
	Half Mask	Full Face	Helmet or Hood
Single use dust mask	5	-	-
APR with dust mist fume filter	10	10	-
APR with HEPA filter or sorbent cartridges	-	50	-
Powered air-purifying respirator (PAPR)	50	50	25
ASR-SAR-demand	10	50	-
ASR-SAR-continuous flow	-	50	25
ASR-SAR-pressure-demand	1,000	2,000	-
ASR-SCBA-demand	-	50	-
ASR-SCBA-pressure-demand	-	10,000	-
ASR-SAR/SCBA combination	-	10,000	-

### 5.6.3 Medical Evaluations

Medical evaluations, to determine the employee's ability to use a respirator, must be provided before the employee:

- (1) Is fit tested, or
- (2) Is required to use the respirator for a specific task in the workplace.

Medical evaluations may be discontinued when the employee is no longer required to use a respirator.

Medical evaluations will be conducted by a physician or licensed health care professional (PLHCP).

Medical evaluations shall include the use of the "OSHA Respirator Medical Evaluation Questionnaire" form (Figure A6-2) or an initial medical examination that obtains the same information as the medical questionnaire.

**5.6.3.1 Medical Determination.** The "Respirator User Medical Determination" (Figure A6-3) or equivalent must be provided to the SSC before employee use of a respirator is permitted. A copy of the "Respirator User Medical Determination" or equivalent must be provided to the SSC before the use of a respirator is permitted.

#### **5.6.4 Fit Testing Procedures for Tight-Fitting Respirators**

Before an employee is required to use any negative or positive pressure tight-fitting facepiece respirator, they must be fit tested with the same make, model, style, and size of respiratory that will be used.

Employees using a tight-fitting respirator must be fit tested:

- (1) Prior to initial use.
- (2) Whenever a different respirator facepiece (size, style, model or make) is used.
- (3) Annually.
- (4) Whenever the employee reports changes in their physical condition that could affect respirator fit.
- (5) Whenever the PLHCP, supervisor, Company Program Administrator, or SSC makes visual observations of changes in the employee's physical condition that could affect respirator fit.

**Note:** Conditions that could affect respiratory fit include facial scarring, dental changes, cosmetic surgery, or an obvious change in body weight.

The fit test administered shall be in accordance with the OSHA approved qualitative fit test (QLFT) or quantitative fit test (QNFT) protocols found in 29 CFR 1910.134 Appendix A. Records of the fit test must be documented on the "Fit Test Record" form (Figure A6-4) or equivalent. Copies of the fit test form must be provided to SSC before employee use is permitted.

QLFT may be used to fit test negative pressure air-purifying respirators that must achieve a fit factor of 100 or less.

#### **5.6.5 Use of Respirators**

**5.6.5.1 Facepiece Seal Protection.** Respirators will not be worn by employees who have:

- (1) Facial hair that comes between the sealing surface of the facepiece and the face or that interferes with valve function.
- (2) Any condition that interferes with face-to-facepiece seal or valve function.  
Personal protective equipment, including corrective glasses, must not be worn in a manner that interferes with the seal of the facepiece to the face of the user.

For all tight-fitting respirators, the user must perform a user seal check each time they put on the respirator. User seal checks that are permitted are those listed in Figure A6-5 or

procedures recommended by the respirator manufacturer that are as effective as those in Figure A6-5.

Users of respirators are prohibited from removing the respirator in a hazardous environment.

**5.6.5.2 Continuing Respirator Effectiveness.** Employees shall leave the respirator use area whenever the employee:

- (1) Needs to wash their hands and respirator facepieces to prevent eye or skin irritation associated with respirator use;
- (2) Detects vapor or gas breakthrough;
- (3) Detects change in breathing resistance;
- (4) Detects leakage in the facepiece; or
- (5) Needs to replace the respirator or the filter, cartridge, or canister elements.

The respirator must be replaced or repaired before allowing the employee to return to the work area whenever the following is detected by the employee:

- (1) Vapor or gas breakthrough;
- (2) Change in the breathing resistance;
- (3) Leakage in the facepiece; or
- (4) Any other occurrence that could affect the safety or health of the user.

**5.6.5.3 Procedures for IDLH Atmosphere.** When respirators are used in IDLH atmospheres, the following must be followed:

- (1) One employee or, when needed, more than one employee, is located outside the IDLH atmosphere.
- (2) Visual, voice, or signal line communication is maintained between the employee(s) in the IDLH atmosphere and the employee(s) located outside the IDLH atmosphere.
- (3) The employee(s) located outside the IDLH atmosphere are trained and equipped to provide effective emergency rescue.
- (4) The supervisor is notified before the employee(s) located outside the IDLH atmosphere enters the IDLH atmosphere to provide emergency rescue.

- (5) The supervisor, once notified, provides necessary assistance appropriate to the situation.
- (6) Employee(s) located outside the IDLH atmosphere must be equipped with the following:
  - (a) Pressure-demand or other positive pressure SCBAs, or a pressure-demand or other positive pressure-supplied air respirator with auxiliary SCBA.
  - (b) One of the following:
    - (i) Appropriate retrieval equipment for removing the employee(s) who enter these hazardous atmospheres where retrieval equipment would contribute to the rescue of the employee(s) and would not increase the overall risk resulting from entry; or
    - (ii) Equivalent means for rescue where retrieval equipment is not required because such equipment would increase the overall risk resulting from entry.
- (7) In confined spaces where an IDLH atmosphere is present or is possible, entry must comply with the permit-required confined space entry procedures.

## **5.6.6 Maintenance and Care of Respirators**

### **5.6.6.1 Cleaning and Disinfecting.**

- (1) Employees will be provided with a respirator that is clean, sanitary, and in good working order.
- (2) Respirators will be cleaned and disinfected in accordance with Figure A6-6 or procedures recommended by the respirator manufacturer, provided that such procedures are of equivalent effectiveness.
- (3) Respirators will be cleaned and disinfected at the following intervals:
  - (a) Respirators issued for exclusive use of an employee will be cleaned and disinfected at least weekly when in use or as often as necessary to be maintained in a sanitary condition.
  - (b) Respirators issued to more than one employee will be cleaned and disinfected before being worn by different individuals.

- (c) Respirators used in fit testing and training will be cleaned and disinfected after each use.

**5.6.6.2 Storage.** When respirators are not in use, employee(s) will store their respirators in a manner that will protect them from damage, contamination, dust, sunlight, extreme temperatures, excessive moisture, and damaging chemicals.

Employee(s) will pack or store their respirators in plastic bags, or equivalent, and in a manner to prevent deformation of the facepiece and exhalation valves. The storage containers will be labeled with the employee's name and company name.

**5.6.6.3 Storage of Emergency Respirators.** No respirators designated as emergency respirators will be kept at the site.

**5.6.6.4 Inspection.**

- (1) All respirators used in routine situations will be inspected before each use and during cleaning.
- (2) Emergency escape respirators shall be inspected before being carried into the workplace for use.
- (3) Respirator inspections will include the following:
  - (a) A check of respirator function, tightness of connections and the condition of the various parts including, but not limited to, the facepiece, head strap valves, connecting tube, and cartridges, canisters, or filters; and
  - (b) A check of the elastomeric parts for pliability and signs of deterioration.
- (4) Self-contained breathing apparatus will be inspected monthly:
  - (a) Air and oxygen cylinders will be maintained in a fully charged state.
  - (b) Air and oxygen cylinders will be recharged when the pressure falls to 90 percent of the manufacturer's recommended pressure level.
  - (c) The regulator and warning devices will be tested to ensure they function properly for respirators maintained for emergency use.

**5.6.6.5 Repairs.** Respirators that fail inspections or are otherwise found to be defective will be removed from service and discarded, or repaired or adjusted.

### 5.6.7 Breathing Air Quality for Atmosphere-Supplying Respirators

**5.6.7.1 Air Quality.** Compressed and liquid oxygen will meet the United States Pharmacopoeia requirements for medical or breathing oxygen.

Compressed breathing air will meet at least the requirements for Type 1 Grade D breathing air described in American National Standards Institute (ANSI)/Compressed Gas Association (CGA) Commodity Specification for Air, G 7.1-1989, as listed in Table 5-2. Unless stated otherwise, evidence of testing the air quality in accordance with this section must be maintained and made available to the SSC upon request.

Table 5-2 Compressed Breathing Air Specifications for Type 1 Grade D Air	
Oxygen content	19.5 - 23.5 percent
Hydrocarbons (condensed)	5 milligrams/m <sup>3</sup>
Carbon monoxide (CO)	<10 ppm
Carbon dioxide (CO <sub>2</sub> )	<1,000 ppm
Odor	Lack of noticeable odor
Dew point	-50°F at 1 atmosphere or 63 ppm moisture content (v/v)

**5.6.7.2 Air Cylinders.** Cylinders used to supply breathing air to respirators will be tested and maintained as prescribed in Shipping Container Specification Regulations of the Department of Transportation (49 CFR Part 173 and Part 178). Hydrostatic testing schedule for cylinders used to supply breathing air to respirators is listed in Table 5-3.

Table 5-3 Hydrostatic Testing Schedule	
Cylinder type	Test Frequency
Steel	Every 5 years
Aluminum	Every 3 years
Fiberglass wrapped aluminum	Every 3 years

Cylinders of purchased breathing air must be accompanied with a certificate of analysis from the supplier that the breathing air meets the requirements of Type 1 Grade D breathing air and that the moisture content in the cylinders does not exceed a dew point of -50° F at 1 atmosphere pressure. Table 5-4 provides moisture conversion data for dew points.

Table 5-4 Moisture Conversion Data			
Dew Point (°F)	Dew Point (°C)	Moisture Content (ppm(v/v))	Moisture Content (mg/L)
-65	-53.9	23	0.017
-60	-51.1	32	0.024
-55	-48.3	45	0.034
-50	-45.6	63	0.047
-45	-42.8	87	0.065
-40	-40.0	120	0.089
-35	-37.2	165	0.12
-30	-34.4	225	0.17
-25	-31.6	305	0.23
-20	-28.9	400	0.30
-15	-26.1	525	0.39
-10	-23.3	690	0.51
-5	-20.5	895	0.67
0	-17.8	1,180	0.88

**5.6.7.3 Testing Air Quality and Flow.** Breathing air derived from cylinders will be tested for air quality in accordance with Table 5-5.

Table 5-5 Minimum Periodic Air Testing for Purchased Breathing Air	
Method of Preparation	Minimum Testing Required
Compression--Supplier does not fill cylinders with any other gases	Check 10 percent of cylinders of each lot for ppm CO and odor.
Compression--Supplier fills cylinders with gases other than air	Analyze all cylinders for percent oxygen. Check 10 percent of cylinders of each lot for ppm CO and odor.
Reconstitution	Analyze all cylinders for percent oxygen. Check 10 percent of cylinders of each lot for ppm CO and odor.



**5.6.7.4 Air Compressors.** Compressors used to supply breathing air to respirators must be constructed and situated so as to:

- (1) Prevent entry of contaminated air into the air-supply system.
- (2) Minimize moisture content so that the dew point at 1 atmosphere pressure is 10° F (5.56° C) below the ambient temperature. Table 5-4 provides moisture conversion data for dew points.
- (3) Have suitable in-line air-purifying sorbent beds and filters to ensure breathing air quality. Sorbent beds and filters shall be maintained and replaced or refurbished periodically following the manufacturer's instructions.
- (4) A tag listing the most recent change date and the signature of the person authorized by the employee to perform the change must be kept at the compressor. An example of an acceptable tag is in Figure A6-7.

**5.6.7.5 Nonoil-Lubricated Compressor.** Procedures must be developed for ensuring carbon monoxide levels in the breathing air do not exceed 10 parts per million.

**5.6.7.6 Oil-Lubricated Compressors.** When oil-lubricated compressors are used to provide breathing air, carbon monoxide alarms must be used to limit the level of carbon monoxide to 10 ppm, or high temperature alarms and monitoring the air supply at sufficient intervals must be used to prevent carbon monoxide in the breathing air from exceeding 10 ppm.

**5.6.7.7 Breathing Air Couplings.** Breathing air couplings used at the worksite must be incompatible with outlets for nonrespirable worksite air or other gas systems.

No asphyxiating substances shall be introduced into breathing air lines.

#### **5.6.8 Testing Breathing Air from Compressors**

The compressor used to provide breathing air must be tested periodically to ensure breathing air quality. Before the compressor is first used, it must be tested for acceptable air quality. Representative sampling of the compressor air output will be performed to ensure that it complies with the requirements of Type 1 Grade D air and that the dew point at 1 atmosphere pressure is 10°F (5.56°C) below the ambient temperature.

To ensure a continued high quality air supply, and to account for any distribution system contaminant input, a representative sample should be taken at distribution supply points. Specific tests that are required are given in Table 5-6.

Table 5-6 Periodic Air Testing for Compressed Breathing Air			
Type/Sample	Oil-Lubricated	Nonoil-Lubricated	Combustion Engine Powered
Water Vapor	X	X	X
CO	X		X
Condensed Hydrocarbon	X		X
CO <sub>2</sub>			X
Odor	X	X	X
<b>Notes:</b> 1. When using air compressors, intake location shall be carefully selected and monitored closely to ensure air supplied to the compressor is of adequate quality. 2. No frequency for periodic checks of air quality is specified, due to wide variation in equipment type, use and working environments, and operating experience. 3. Continuous monitoring of temperature and carbon monoxide is not required. 4. For nonoil-lubricated compressors that operate at less than 35 psi, no sampling for water is required. 5. These requirements apply to systems designed for breathing air; other air supply systems need to be evaluated on a case-by-case basis for the type and frequency of testing.			

### 5.6.9 Voluntary Use of Respirators

Respirators may be provided at the request of the employee when not required to control occupational diseases or injuries caused by breathing air contaminated with harmful dusts, fogs, fumes, mists, gases, smoke, sprays, or vapors. Respirators may be provided for voluntary use by the employee if the respirator will not in itself create a hazard.

- (1) The employee using the respirator voluntarily shall be provided a copy of the information contained on Figure A6-8, titled "Information for Employees Voluntarily Using Respirators."
- (2) The employee must be medically able to use the respirator as determined in accordance with this procedure.
- (3) The respirator must be cleaned, stored, and maintained in accordance with this procedure, so that its use does not present a health hazard to the user.

Exception: Employees whose only use of respirators involves the voluntary use of filtering facepieces are exempt from complying with Items 2 or 3 above.

#### **5.6.10 Training Users of Respiratory Protection**

Training of respirator users will be performed initially, before use of the respirator, annually thereafter, and more frequently if necessary.

Voluntary users of respirators will be provided the basic information on respirators found on Figure A6-8.

Documentation of training must be provided to the SSC before respirator use is permitted.

### **5.7 Gases, Vapors, Fumes, Dusts, and Mists**

Special considerations will be given to all operations, materials, and equipment that emit toxic gases, fumes, vapors, dusts, or mists into the working environment. If it is determined that such atmospheric contaminants may be released into areas where persons are employed, the concentrations of the contaminants will be brought within safe limits by design and engineering controls, such as ventilation, filtration, or installation of exhaust systems. When contaminants cannot be adequately controlled by design and engineering methods, special operating procedures will be developed to provide the equivalent protection. Acceptable safe limits for contaminants are those recommended in the latest edition of the "Threshold Limit Values for Chemical Substances and Physical Agents in the Workroom Environment," published by the American Conference of Governmental Industrial Hygienists, and 29 CFR Part 1926 Parts D and Z.

#### **5.7.1 Testing**

Approved testing devices will be used for determining concentrations of toxic and flammable gases, vapors, fumes, dusts, mists, and oxygen deficiency. Tests will be performed, and collected data will be analyzed and evaluated by a competent person. Worksite environments will be sampled and evaluated during initial start of operation and once each shift thereafter until the environmental hazard has been abated. More stringent testing and evaluating requirements for specific operations or functions contained elsewhere in these standards supersede these requirements.

### **5.7.2 Periodic Verification**

The efficiency of the control system, equipment, devices, and methods will be checked and verified periodically. Control systems will be operated continually during operations where persons are exposed to airborne contaminants or flammable gases.

### **5.7.3 Maintenance**

Exhaust systems and air cleaning equipment will be designed and installed in a manner that facilitates routine maintenance and the removal of dust or other collected material without contaminating the general atmosphere.

### **5.7.4 Disposal**

Toxic materials removed by exhaust systems or other methods will be disposed of in a manner that will not create a hazard to other employees or the public.

### **5.7.5 Portable Equipment**

Airborne contaminants exceeding acceptable safe limits created by portable equipment, such as saws, drills, and grinding machines, will be effectively controlled at the source.

### **5.7.6 Oxygen Deficiency**

Employees will not be permitted to enter or work in atmospheres containing less than 19.5 percent oxygen, by volume, unless provided with and trained in the use of applicable respiratory protective devices specified in Section 5.6.2.1.

## **5.8 Insects, Vermin, and Snakes**

Protection from exposure to insects, vermin, or snakes will include the following controls as necessary to eliminate or reduce the hazard.

- Boots, hoods, netting, gloves, masks, or other necessary personal protection.
- Repellents.
- Drainage, spraying, burning, or destruction of breeding areas.
- Smudge pots and aerosols for protecting small areas.
- Elimination of unsanitary conditions which propagate insects or vermin.
- Inoculation of exposed employees when recommended by a consulting physician.
- First-aid and medical facilities available to treat infected employees.
- Instruction in recognition and identification.

- On jobsites where insects, vermin, or snakes are present, supervisors will instruct employees on the avoidance of such hazards. Any and all control methods mentioned above will be used to protect workers. First-aid and medical services providers will also be made aware of the hazards and will prepare for occurrences.

## **5.9 Poisonous Plants**

In areas where employees are exposed to poison ivy, oak, sumac, or other poisonous plants, the following protective measures will be taken as appropriate:

- Plants will be removed or destroyed.
- Protective clothing will be worn.
- Protective ointments and wash-up solutions will be provided.
- Soap and water will be available for washing exposed skin.
- Approved first-aid and medical facilities will be available for treatment of infected employees.
- Immunization will be provided for exposed employees as recommended by a consulting physician.
- Instruction in recognition and identification will be provided.

## **5.10 Acids, Caustics, and Harmful Chemicals**

Handling, storage, and use of acids, caustics, and harmful chemicals or materials will be in accordance with the manufacturer's recommendations and under supervision of a qualified person. These chemicals and products will be stored in areas accessible only to authorized persons. Employees working with acids, caustics, or any other harmful chemical should refer to the Hazard Communication Program (Section 8.6.4).

### **5.10.1 Disposal**

Disposal of surplus, excess, or waste materials and containers will be carried out so as not to contaminate or pollute water supplies, rivers, lakes, reservoirs, or streams and will comply with federal, state, and local regulations.

### **5.10.2 Protective Clothing and Equipment**

Persons handling these substances will wear protective clothing and use protective equipment as specified by the chemical's MSDS and other requirements as outlined in this manual.

### **5.10.3 First Aid**

First-aid and medical facilities adequate to effectively treat exposed persons will be available. The facility must be made aware of the potential hazards and be prepared and supplied to adequately treat an affected employee.

### **5.10.4 Emergency Facilities**

Chemical laboratories, battery charging rooms, and operations requiring use of these materials will have an emergency approved eyewash and shower immediately available to the work area.

## **5.11 Ionizing Radiation**

Prior to the initial use, storage, or handling of radioactive material, a written Task HASP will be developed. The plan will include the proposed location, the nature and scope of the operations, and the health and safety precautions to be taken.

- **Exposure:** Radioactive materials will be stored, handled, used, and disposed of in accordance with the controls and precautionary procedures prescribed in the Nuclear Regulatory Commission's (NRC's) "Standards for Protection Against Radiation," Title 10, Code of Federal Regulations, Part 20. In no event will employees be exposed to radiation levels exceeding the permissible limits set forth in the referenced regulation.
- **Supervision:** Operations involving radiation hazards will be performed only under the direction of a qualified radiation specialist responsible for the health and safety of the employees engaged in the operations and for compliance with radiation protection standards. Only persons licensed or under the direction and supervision of the licensee will handle materials under NRC license.
- **Dosage:** Determination of radiation dosage received by persons and the degree of hazard present will be based on the standards published in the NRC "Standards for Protection Against Radiation-Basic Radiation Protection Criteria." The dose for an individual will be considered to include all doses from both internal and external sources and from all types of ionizing radiation to which the individual is exposed.
- **Records:** Dosimetry will be maintained for all individuals exposed to radiation in amounts of one-fourth the permissible limits and for all individuals who enter areas of high radiation. Records will be maintained in such a manner that cumulative exposure of individuals to radiation can readily be determined.

- Instruments: Instruments and dosimetry devices will be approved types designed to detect and measure cumulative dosage of the type to which personnel are exposed.
- Medical: All cases of overexposure and/or suspected ingestion or inhalation will be immediately referred to a physician.
- Transportation: Transportation of radioactive materials will be in compliance with the requirements of the Department of Transportation (DOT).
- Containers: All containers of radioactive material and all areas where radioactive material is used or stored will be labeled with the standard radiation symbol.
- Access: Only authorized persons will be allowed in areas where radioactive materials are used or stored.

## **5.12 Nonionizing Radiation**

The following requirements will be utilized when working around lasers:

- Restriction: Only continuous wave (cw) lasers with output power levels of 10 milliwatts per square centimeter ( $\text{mW}/\text{cm}^2$ ) or less and installed and operated in accordance with these standards will be used. When laser power output exceeds  $10 \text{ mW}/\text{cm}^2$ , laser operational procedures will be developed and monitored by a qualified laser safety officer; employee exposure levels will not exceed nationally recognized safe values (TLVs, PELs), and the laser equipment and system conform to recommended procedures and control measures contained in the latest edition of ANSI Z136.1, Standards for the Safe Use of Lasers.
- Qualified Personnel: The installation, adjustment, and operation of laser equipment will be performed by competent personnel trained in the use of lasers. Proof of qualification and training will be in the possession of the operator when operating laser equipment.
- Eye Protection: Individuals working or entering areas in which a potential exposure to direct or reflected laser light exceeding 0.005 watt (5 milliwatts) will wear laser safety goggles that will provide protection for the specific wavelength of the laser used and will be of an optical density, attenuation factor, and design of laser eye protection as set forth for the operation.
- Warning Signs: Areas in which lasers are used will be posted with standard laser warning signs.
- Beam Shutters: Beam shutters or caps will be used or the laser turned off when laser transmission is not being performed. When left unattended for extended times such as lunch period, shift change, etc., the laser will be turned off.

- Deflectors: Only mechanical or electronic devices will be used as deflectors for guiding the internal alignment of the laser.
- Beam Location: Revolving laser units will be operated only above or below the eye level of individuals unless the areas are inaccessible to persons and posted accordingly. The laser beam will not be directed at individuals.
- Weather Conditions: Wherever possible, lasers will not be used when it is raining, snowing, or there is dust or fog in the air. In any event, individuals will be kept out of range of the source and target areas during these conditions.
- Labeling Equipment: Laser equipment will bear a label indicating the manufacturer maximum output and beam spread.
- Light Intensities: Individuals will not be exposed to light intensities exceeding the following:
  - Direct Staring: 1 microwatt per square centimeter.
  - Incidental Observing: 1 milliwatt per square centimeter.
  - Diffused Reflected Light: 2.5 watts per square centimeter.
- Microwaves: Individuals will not be exposed to microwave power densities in excess of 10 milliwatts per square centimeter.

## **5.13 Hearing Conservation Program**

### **5.13.1 Noise Levels**

Employees will be protected from the effects of harmful noise levels. This responsibility will include provisions for determining the presence of harmful noise levels and the implementation of an effective hearing conservation program when noise levels exceed the values set forth herein. The construction manager will ensure that noise levels are monitored in all areas where employees are working. These noise levels will be evaluated by a qualified individual or by a trained individual under the supervision of an industrial hygienist. The Noise Level Survey Form will be used to record the noise monitoring results. See Figure A6-9 for an example of the Noise Level Survey Form.

Protection against the effects of noise exposure will be provided when the sound levels exceed those shown below when measured on the A-scale of a Standard Type 2 sound meter at a slow response in accordance with Table 5-7.



Table 5-7 A-Scale of a Standard Type 2 Sound Meter	
Duration per Day, Hours	Sound Level, db Slow Response
8	90
6	92
4	95
3	97
2	100
1.5	102
1	105
0.5	110
0.25 or less	115

Sound levels will be measured using sound level meters meeting current ANSI S1.4 "Specification for Sound Level Meters," or dosimeters meeting current ANSI S1.25, "Specifications for Personnel Noise Dosimeters."

#### **5.13.2 Periodic Monitoring**

Noise monitoring or measuring will be conducted when exposures are at or above 85 db or when employees complain of the loudness of the noise. To determine if areas are at or above 85 db, an initial noise monitoring will be conducted when the project is started as well as in excessively noisy areas.

Engineering controls, such as barriers, mufflers, or walls, will be used when practicable. The use of such devices will be an effective countermeasure that reduces the noise levels below the action level.

Administrative controls such as rotating affected individuals out of the noisy areas will be used when deemed practicable by the construction manager. The individuals performing the operation will be closely monitored, and their exposure limits will not exceed the amount of time deemed safe by the noise level chart for any reason.

When sound levels exceed those set forth in the table above, and engineering or administrative controls are not practicable or effective, hearing protection devices will be provided and used, and an effective hearing conservation program will be administered.

This program will incorporate the following minimal provisions:

- Audiologist: The services of a recognized audiologist will be employed to serve as a consultant in establishing and carrying out an effective hearing conservation

program. Exceptions may be granted to this requirement when conditions warrant a lesser degree of protection.

- **Hearing Protectors:** Employees will be provided and required to use hearing protectors that meet ANSI S3.19 and attenuate employee exposure to at least the safe noise level.
- **Education and Training:** Employees will be informed of hazardous areas through appropriate signs and instructions (preferably in tool-box and safety task assignment meetings). Training on the proper use and maintenance of hearing protectors is also to be provided.

## **6.0 Monitoring Program**

### **6.1 Real Time Monitoring**

Direct reading instruments are used as real time air monitors. The results of the direct reading instruments are compared to the Monitoring Equipment Action Levels (Attachment 7) that describes the protective action that is to be taken to control exposure. The action levels describe the location of the real time monitoring activity and the action to be taken if predefined values are met or exceeded. Site specific operations or tasks may have other action levels established. Any change to the action level task will be noted in the appropriate Task HASP.

The frequency and location of all real time monitoring activity is based upon the nature of the site activity. Periodic real time monitoring will be performed, at a minimum, whenever the following activities occur.

- Beginning of site activity.
- Operations change.
- Work begins on a different portion of the site.
- Beginning of invasive site activity.
- Contaminants other than those previously identified are being handled.
- Personnel begin to handle obviously contaminated materials.
- Personnel are handling leaking drums or containers.
- Personnel are performing tasks that are likely to expose them to peak levels of contaminants.
- Instrumental or sensible detection of the presence of a chemical contaminant.
- Change in the weather.

### **6.2 Air Monitoring Result Logging**

Before any field activities commence, the background levels of the site must be measured and recorded. Daily background readings must be conducted away from areas of potential contamination to obtain accurate results.

All monitoring results must be recorded in the field log. The monitoring results should indicate the following information.

- Range of readings.
- Mode of readings.
- Time.
- Location of reading.

- Activity during reading.
- Weather conditions.
- Wind direction.
- Action taken.

### **6.3 Personnel Monitoring**

Personnel monitoring will be performed whenever required by an OSHA chemical-specific standard found in 29 CFR 1910.1001-.1048 or when deemed necessary to protect the health of the field team members. All personnel monitoring will be performed in accordance with accepted sampling and analytical procedures as defined by the HSM. Specifics of the monitoring will be described in the Task HASP.

Personnel who are likely to have exposures above OSHA-Permissible Exposure Levels (PELs) or published exposure levels for hazardous substances shall participate in a personal air sampling program. Air monitoring shall be used to identify and quantify airborne levels of hazardous substances in order to determine the appropriate level of employee protection needed onsite. Specifics of the monitoring will be described in the Task HASP.

### **6.4 Operation, Maintenance, and Calibration**

The SSC is responsible for the proper operation, maintenance, and calibration of each instrument to be used. The operation, maintenance, and calibration instructions in the equipment manuals will be followed. The equipment manuals will be kept in the support zone during field activities. As a minimum, at the beginning of each day the instruments will be calibrated according to the manual. At the end of each day, a check of the calibration of the instrument will be performed. This end-of-the-day check may be less stringent than the beginning-of-the-day calibration as long as it verifies accurate readings were taken through the day.

### **6.5 Initial Survey**

Prior to any site activities, the SSC will conduct perimeter and general site monitoring, upwind and downwind, to establish background levels.

If information from the site characterization indicates a potential for ionizing radiation or IDLH condition onsite or if insufficient information is available to demonstrate otherwise, then monitoring shall include: monitoring with direct reading instruments to determine the presence of ionizing radiation or IDLH conditions including oxygen deficient, explosive, and toxic atmospheres; and visual observations for actual or potential IDLH conditions onsite.

Upon initial entry to an area, representative air monitoring will be conducted using direct reading instruments to identify IDLH conditions, exposures above OSHA-PELs, or other allowable exposure levels, including exposure to radiation, flammable atmospheres, or oxygen deficient atmospheres.

## **6.6 Periodic Survey**

Periodic monitoring shall be conducted when the possibility of an IDLH condition or flammable atmosphere has developed or when there is an indication that exposure may have risen over OSHA-PELs or published exposure levels for hazardous substances

After site activities have commenced, the selective monitoring of high-risk workers, i.e., those who are closest to the source of contaminant generation, is essential. Those employees working closest with the source have the highest likelihood of being exposed to concentrations which exceed established exposure limits or action levels.

Monitoring efforts will focus on personnel most likely to receive the highest exposures and on all personnel likely to be exposed to any substance above the action level or OSHA-PEL. High risk workers will be monitored at least every 30 minutes when the potential for exposure exists.

Monitoring will be performed whenever new work begins on a different position of the site, any time that new contaminants are encountered that differ from those initially encountered, every time a different operation is initiated, whenever employees are working in areas of obvious liquid contamination or employees are handling leaking containers.

## **6.7 Perimeter Monitoring**

The SSC is responsible for determining if site activities could negatively impact zones outside the contamination reduction zone. If action levels for airborne contaminants listed in the Action Level Table are exceeded, the SSC will perform monitoring at the perimeter of the contamination reduction zone to determine if the contaminants are getting out of the controlled zones. If action levels are exceeded at these locations, the SSC must advise the Project Manager (PM) and the BVSPC HSM. If necessary, the control zones will be expanded to compensate for the presence of the contaminants.

If the release of contaminants could negatively impact the health and safety of the surrounding areas, the SSC will contact the local emergency response organization responsible for protecting public health from chemical exposures. This agency will be identified prior to the beginning of site activities as part of the emergency preplanning procedures. The SSC will then notify the site representative, PM, and BVSPC HSM. The PM will notify the client of the

chemical release and the actions taken by the SSC. Notification will be made in accordance with Section 9.6, Spills or Leaks.

## **7.0 Site Control**

The objective of site control is to control the activities and movement of people and equipment at hazardous waste sites in order to minimize the potential for worker or public exposure to hazardous substances, the spread of hazardous substance in the environment, or vandalism.

### **7.1 Site Mapping**

A map of the site is located in Attachment 1. The purpose of this map is to assist site personnel in planning and organizing response activities.

The Task HASP will contain site maps that are specific to the area where specific tasks will take place. This map will include the following information: prevailing wind direction, magnetic north, site drainage points, previous sampling locations, planned sampling locations, locations of expected contamination, planned control zones, all natural and man-made topographic features including the location of buildings, containers, impoundments, pits, ponds, tanks and any other site features.

The Task HASP specific site map will be upgraded to reflect new information gained after initial site entry or from subsequent sampling and analysis activities or changes in site conditions, including changes resulting from accidents, ongoing site operations, hazards not previously identified, new materials introduced onsite, unauthorized entry, vandalism, or weather conditions.

Use of overlays or other mapping techniques may be used to reduce cluttering of information.

### **7.2 Work Zones**

Work zones will be established to:

- Reduce the accidental spread of hazardous substances by workers or equipment from the contaminated areas to the clean areas.
- Confine work activities to the appropriate areas, thereby minimizing the likelihood of accidental exposure.
- Facilitate the location and evacuation of personnel in case of an emergency.

To accomplish this, the site will be divided into as many zones as necessary to ensure minimal employee exposure to hazardous substances. As a minimum, three zones will be identified: the Exclusion Zone, the Contamination Reduction Zone, and the Support Zone.

Movement of personnel and equipment between these zones should be minimized and restricted to specific Access Control Points to prevent cross-contamination from contaminated areas to clean areas.

These zones are established so field personnel can identify where the site hazards exist. The work zones will be established so nonessential personnel will not be affected by the hazards and the hazards do not leave the zones. Details of the work site control zones will be established by the SSC prior to stating site activities and will be established so that the support zone is upwind of the Exclusion Zone or at a distance far enough away that it is not affected by the dispersion of contaminants from the Exclusion Zone.

Following is a description of each work zone and the factors to be considered when establishing them.

### **7.2.1 Exclusion Zone**

The Exclusion Zone is the innermost area of the three areas and is considered contaminated. Within this area, levels of protection prescribed in the site HASP will be used by all personnel. An Access Control Point (ACP) will be established at the periphery of the Exclusion Zone to control the flow of personnel and equipment between it and the Contamination Reduction Zone and to check that entrance and exit procedures are followed. The extent of the Exclusion Zone is determined by the following:

- Location, nature, and toxicity of the waste materials.
- Meteorological conditions affecting potential dispersion of contaminants.
- Concern for minimal exposure of the unprotected public and investigation personnel.
- Topography.

The Exclusion Zone boundary ("hot line") will be established at a reasonably safe distance from drums, tanks, ponds, liquid run-off, or other physical indicators of hazardous substances. This distance will be established by the SSC before site activities begin and will take into account such factors as physical condition of site, weather conditions, sources of potential hazard, and duration of activity. Subsequent to the start of operations, the boundary may be readjusted based on observation or measurements. The boundary will be physically secure and posted, well defined by geographical boundaries, or otherwise delineated.

The Exclusion Zone could be further divided into zones with different levels of protection for each zone. Based upon environmental measurements or expected onsite work practices, locations within the Exclusion Zone would be defined in accordance with the level of protection required for that area. This procedure would allow for more flexibility in operation, decontamination procedures, and resource utilization.



### **7.2.2 Contamination Reduction Zone**

The area between the Exclusion and Support Zones is the Contamination Reduction Zone. The purpose of the Contamination Reduction Zone is to prevent the transfer of contaminants that may have been picked up by personnel or equipment leaving the Exclusion Zone. An area within the Contamination Reduction Zones is the Contamination Reduction Corridor (CRC). The CRC is a path that persons or vehicles must take during decontamination. The CRC controls access into and out of the Exclusion Zone and confines decontamination activities to a restricted area. The CRC must be laid with plastic sheeting or equivalent.

At the boundary between the Contamination Reduction Zone and the Exclusion Zone is the hot line and access control point. Entrance into the Exclusion Zone requires the wearing of the prescribed personal protection equipment and adherence to established site entry procedures. Equipment requirements for working in the Contamination Reduction Zone may be different than those for the Exclusion Zone. At a point close to the hot line, a decontamination station will be established for both personnel and equipment exiting the Exclusion Zone. Another decontamination station may be established closer to the contamination control line for those working only in the Contamination Reduction Zone. In addition, a vehicle decontamination station will be established as necessary.

The boundary between the Support Zone and the Contamination Reduction Zone is the Contamination Control Line. Entry into the Contamination Reduction Zone from the Support Zone will be through a common point. Personnel entering at this station must be wearing the prescribed PPE for working in the decontamination area. Exiting the Contamination Reduction Zone to the Support Zone requires the removal of any suspected contaminated personal protection equipment and compliance with decontamination procedures.

All facilities and operations located in the Contamination Reduction Zone will be positioned upwind of the actual waste location whenever possible.

### **7.2.3 Support Zone**

The Support Zone is the outermost region and is considered a non-contaminated or clean area. It will contain the field office, first aid area, and other facilities necessary to support site activities. Change rooms, lunch and break areas, supplies, equipment storage, and maintenance areas may be located in this area. Onsite, eating, drinking, and smoking will be allowed only in this area. Support facilities will be located upwind from the Exclusion and Contamination Reduction Zones in relation to the prevailing wind whenever possible.

A support center or command center will be established in the Support Zone for each activity and will include the following as a minimum:

- Fully stocked industrial first aid kit.
- 15 minute eye wash station.
- Fire extinguisher (10A60BC multipurpose dry chemical).
- Telephone or radio communications capability.
- Posted emergency telephone numbers.
- Posted site and task HASPs.
- Posted OSHA "Job Safety and Health Protection" poster.
- Posted OSHA Noise standard.
- Copy of Black & Veatch Focus on Health and Safety.
- Posted map with route to hospital.
- Instrument manuals.
- Binder of MSDS.
- BVSPC "Health and Safety Manual for Hazardous Waste Site Investigations."
- USEPA Standard Operating Safety Guides.

At the discretion of the SSC, the support center may be based in an onsite vehicle.

### **7.3 Buddy System**

Except for Level D work involving non-intrusive methods, the implementation of a buddy system is mandatory for entry into the Contamination Reduction Zone or the Exclusion Zone. The prime objective of the buddy system is to ensure rapid assistance in the event of an emergency.

Each member of the field team will be designated by the SSC to observe at least one other field team member. The SSC will implement the system at the ACP for personnel entering the Exclusion Zone.

As part of the buddy system, workers will remain close together and maintain visual contact with each other to provide assistance in the event of an emergency. Should an emergency situation arise, workers will use the communication signals established and agreed upon prior to entering the contaminated area. The communication signals are located in Section 8.6.3.

The responsibilities of workers utilizing the buddy system include:

- Providing their buddy with assistance.
- Observing their buddy for signs of chemical exposure.
- Observing their buddy for signs of stress due to temperature extremes.

- Observing their buddy for signs of stress or anxiety while wearing chemical protective clothing.
- Periodically checking the integrity of their buddy's PPE.
- Notifying the SSC or other site supervisory personnel if emergency assistance is needed.

Workers should not rely entirely on the buddy system to ensure that help will be provided in the event of an emergency. To augment this system, workers in contaminated areas should, whenever possible, remain in line-of-sight or communication contact with the SSC or other personnel in the Support Zone.

#### **7.4 Audits**

Inspection and audits of the work area will be conducted by the SSC as necessary to determine the effectiveness of the site HASP or Task HASP. The site HASP and Task HASP will be periodically reviewed by the SSC to keep them current with respect to site conditions. The SSC will report their findings to the site manager. Correcting deficiencies in the effectiveness and application of the site HASP is the responsibility of the site manager. Changes to the site HASP to address any deficiencies will be made to the Task HASP in accordance with the Section 12 of the Task HASP.

#### **7.5 Visitors**

BVSPC recognizes that all visitors' employers are ultimately responsible for their compliance with all applicable OSHA regulations while on a hazardous waste site. BVSPC personnel will be courteous to all visitors and adhere to the following procedures for the safety of the visitors.

- Visitors are expected to have the permission of the site owner to be on the site.
- The SSC will advise all visitors of the nature, level, and degree of exposure likely as a result of BVSPC-related activities and the emergency response procedures that pertains to the visitors for the site.
- The SSC will advise all subcontractors coming onto the site of the hazardous chemicals present, effect of exposure, location of the MSDSs, locations of the emergency equipment, the emergency plan, and evacuation procedures.
- Visitors entering the Contamination Reduction Zone and Exclusion Zone at the Site will be offered an opportunity to read the applicable provisions of this site HASP.
- Visitors will be expected to comply with OSHA requirements such as medical monitoring, training, and respiratory protection.

- Visitors will be expected to provide their own PPE.
- In the event that a visitor does not adhere to the provisions of the site HASP, the SSC will request that the visitor leave the work area.
- If the visitor interferes with the work activity or poses a safety hazard to anyone onsite, the SSC will terminate work activities and the BVSPC PM and HSM will be contacted immediately.
- All nonconformance incidents will be recorded in the site log by the SSC.
- The client and governmental authorities may choose to adopt this plan or develop their own to protect their onsite employees, although BVSPC will not take responsibility for compliance of onsite personnel employed by these parties.

## **8.0 Safety and Emergency Procedures**

### **8.1 Standing Safety Orders**

The following standing orders are established to ensure safe work practices. Task specific standing orders are addressed in the Task HASP.

- Report any sign of radioactivity, explosivity, or unusual conditions to the supervisor immediately.
- Check in and out at the entrance ACP of the Exclusion Zone.
- Maintain close contact with your buddy in the Exclusion Zone.
- Eating, drinking, chewing gum or tobacco, smoking, or any practices that increases the probability of hand-to-mouth transfers and ingestion of material is prohibited in any controlled area such as Contaminant Reduction Zone and Exclusion Zone.
- Whenever decontamination procedures for outer garments are in effect, good personal hygiene will be practiced as soon as possible after the protective garment is removed (i.e., washing hands). A shower is recommended immediately after any work period.
- No facial hair that interferes with the effectiveness of a respirator will be permitted on personnel required or potentially required to wear respiratory protection equipment.
- Contact with potentially contaminated surfaces will be avoided whenever possible. Personnel should not walk through puddles, mud, or other discolored surfaces or kneel on the ground. Personnel should not lean, sit, or place equipment on drums, containers, vehicles, or exposed surfaces without plastic covering.
- Medicine and alcohol can magnify the effect from exposure to certain compounds. It will be the responsibility of each BVSPC employee and each subcontractor to notify, on a daily basis, the SSC of any individual who is using prescribed medication. Site personnel will not be allowed onsite while under the influence of alcohol or drugs that cannot be obtained over the counter without a physician's authorization.
- Personnel and equipment in the work areas will be minimized, but consistent with effective site operations.
- All unsafe or inoperable sampling or monitoring equipment left unattended will be identified by the SSC by a "DANGER-DO NOT OPERATE" tag.
- Work will be restricted to daylight hours only.

## **8.2 Medical Emergencies**

At least two BVSPC team members conducting hazardous waste operations at the site will have successfully completed a Red Cross sponsored course in adult first aid and cardiopulmonary resuscitation (CPR). Prior to the start of work, the SSC will make arrangements for medical facilities, ambulance service, and medical personnel to be available for prompt attention to the injured.

Onsite activities will require a first-aid station which will be located within the Support Zone. First-aid kits will be, as a minimum, 16-unit first-aid kits and will be provided in the ratio of one for each 10 persons.

Portable 15-minute emergency eye-wash stations will be provided within the Support Zone. Identification markers will be provided to readily denote locations of the eyewash stations.

Emergency telephone numbers and reporting instructions for ambulance, local physician, hospital, poison control center, fire, and police will be conspicuously posted in the Support Zone.

The SSC will act as the emergency coordinator for all medical emergencies. If a person is injured or becomes ill, personnel identified as trained in first aid and CPR will be notified immediately. First aid and CPR will be administered immediately. In all cases, treatment for shock should be considered. After attending to the victim, the SSC will be notified. Depending on the severity of the injury or illness, the SSC may notify medical emergency response organizations. If the victim is transferred off-site, the SSC will assign a field team member to accompany the victim.

### **8.2.1 Chemical Exposure Emergency**

If personnel experience any adverse effects or symptoms during field activity, the individuals will notify the SSC. The SSC will assess the situation and make a determination on the extent of medical attention needed. If it is determined that the problem was due to chemical exposure, first aid for chemical exposure will be administered as soon as possible. If necessary to transport the individual to the hospital, the individual(s) exposed to those chemicals will be transported by an unexposed individual. The Site HASP and available MSDSs will accompany the group to the hospital. The incident must be reported to the HSM immediately. A written report of the incident will be distributed to the PM and the HSM within 48 hours.

The following first aid for chemical exposures will be administered as soon as possible;

- Eye Exposure—If contaminated solid or liquid gets into the eyes, they will be washed immediately at the 15 minute emergency eyewash station using large amounts of water and lifting their lower and upper lids occasionally. Medical attention will be

obtained immediately. (Use of contact lenses is not permitted in the designated Exclusion Zones).

- Skin Exposure--If contaminated solid or liquid gets on the skin, the affected individual will promptly flush the skin for at least 15 minutes, then wash with soap or mild detergent and water. If contaminated solids or liquids penetrate through the clothing, clothing will be immediately removed and treatment for skin exposure administered. Medical attention will be obtained if symptoms warrant.
- Inhalation--If a person breathes in a large volume of potentially toxic contaminants, the affected person will be moved to fresh air at once. If breathing has stopped, CPR will be performed. The affected person will be kept warm and at rest. Medical attention will be obtained immediately.
- Ingestion--If contaminated solid or liquid is swallowed, medical attention will be obtained immediately.

### **8.2.2 Accident Reporting**

Injuries or illnesses that require attention beyond simple first aid or requiring attention by a physician or involving exposure to blood or other potentially infectious materials must be reported to the Worker's Compensation Administrator and BVSPC HSM as soon as possible but no later than 24 hours after the accident. In the event of a fatality or more than one hospitalization, the notification to the HSM must be immediate. The HSM must notify the local OSHA area office within 8 hours. The SSC must complete the appropriate accident report forms and the required State Workers Compensation form. The SSC is responsible for contacting the State Worker's Compensation Office to obtain the necessary report form. The SSC is responsible for completing the forms and submitting the originals to the BVSPC HSM. Copies should be sent to the Workers Compensation Administrator and PM. Copies must be filed in the project file.

Accidents that must be reported include:

- Injury or illnesses that require attention beyond simple first aid.
- Injury or illnesses that require attention by medical professionals.
- Injury or illnesses that result in time away from work.
- Injury or illnesses that restricts the ability of the injured to work.
- Unconsciousness, explained or unexplained.
- Exposures of personnel to blood or other potentially infectious agents.
- Exposures to chemical or physical agents that result in adverse signs or symptoms.

All incidents that are near miss injury or illness accidents or physical accidents must be summarized on the hazardous waste site investigation activity report form and submitted to the PM and BVSPC HSM as soon as possible.

The SSC is responsible for investigating the cause of all accidents and report on the findings and corrective actions taken in the manner described above. The SSC may request the assistance of the BVSPC HSM or other personnel to investigate the accident. The final report on the accident is the responsibility of the SSC.

Accident investigation and record keeping must comply with the BVSPC accident investigation and record keeping standard operating procedure.

### **8.2.3 Hospital Route**

The route to the hospital is shown and described in Attachment 1. The route to the hospital will be conspicuously posted in the Support Zone. The SSC and key field personnel will drive the route to the hospital emergency room door prior to the start of site activities in order to become familiar with the route. The route will be driven at least weekly to confirm an unobstructed route.

## **8.3 Temperature Extremes**

### **8.3.1 Heat Stress Monitoring**

Heat stress poses a serious health danger to site workers and may create secondary safety hazards by impairing a worker's coordination and judgment. Heat stress can occur at almost any temperature and is more likely when PPE is in use.

The use of protective equipment may create heat stress. Monitoring of personnel will commence when the ambient temperature is 70°F or above. Table 8-1 presents the suggested frequency for such monitoring. Monitoring frequency is dependent on the type of protection worn (permeable or impermeable clothing), the dry bulb temperature, and the amount of sunshine. Monitoring frequency should increase as the ambient temperature increases or as slow recovery rates are observed. Heat stress monitoring should be performed by a person with a current first aid certification who is trained to recognize heat stress symptoms. For monitoring the body's response to excess heat, one or more of the following techniques will be used.

- **Heart rate.** Count the radial pulse before site activities and during a 30-second period as early as possible in the monitoring cycle.
  - If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next cycle by one-third and keep the rest period the same.



- If the heart rate still exceeds 110 beats per minute at the next rest period, shorten the following cycle by one-third.
- **Oral temperature.** Use a clinical thermometer (three minutes under the tongue) or similar device to measure the oral temperature before site activities and at the end of the monitoring cycle (before the worker drinks liquid).
  - If oral temperature exceeds 99.6°F (37.6°C), shorten the next work cycle by one-third without changing the rest period.
  - If oral temperature still exceeds 99.6°F (37.6°C) at the beginning of the next rest period, shorten the following cycle by one-third.
  - Do not permit a worker to wear a semipermeable or impermeable garment when oral temperature exceeds 100.6°F (38.1°C).

Heat stroke is a life-threatening heat disorder that requires life-saving first aid. Decontamination should be omitted prior to obtaining immediate medical attention.

**Heat stress** can become life threatening. Unless the victim is grossly contaminated, decontamination should be omitted or minimized and treatment begun immediately.

- Prevention of Heat Stress. Proper training and prevention measures will aid in averting serious illness and loss of productivity. Heat stress prevention is particularly important because once a person suffers from heat stroke or heat exhaustion that person may be predisposed to additional heat-related illnesses. To avoid heat stress, the SSC has the authority to take the following steps.
- Adjust work schedules
  - Modify work/rest schedules according to monitoring requirements.
  - Mandate work slowdowns as needed.
  - Perform work during cooler hours of the day if possible or at night if adequate lighting can be provided.
- Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods.

Table 8-1 Suggested Frequency of Physiological Monitoring for Fit and Acclimatized Workers <sup>a</sup>		
Adjusted Temperature <sup>b</sup>	Normal Work Ensemble <sup>c</sup>	Impermeable Ensemble <sup>d</sup>
90°F (32.2°C) or above	After each 45 minutes of work	After each 15 minutes of work
87.5 to 90°F (30.8 to 32.2°C)	After each 60 minutes of work	After each 30 minutes of work
82.5 to 87.5°F (28.1 to 30.8°C)	After each 90 minutes of work	After each 60 minutes of work
77.5 to 82.5°F (25.3 to 28.1°C)	After each 120 minutes of work	After each 90 minutes of work
72.5 to 77.5°F (22.5 to 25.3°C)	After each 150 minutes of work	After each 120 minutes of work
<sup>a</sup> For work levels of 250 kilocalories/hour. <sup>b</sup> Calculate the adjusted air temperature (ta adj) by using the equation: $ta\ adj\ ^\circ F = ta\ ^\circ F + (13 \times (\% \div 100) \text{ sunshine}).$ Measure air temperature (ta) with a standard alcohol-in-glass thermometer or equivalent, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent of the time the sun is not covered by clouds that are thick enough to produce a shadow (100% sunshine = no cloud cover and a sharp distinct shadow; 0% sunshine = no shadows). <sup>c</sup> A normal work ensemble consists of cotton coveralls. <sup>d</sup> An impermeable ensemble consists of tyvek coveralls.		

- Maintain worker's body fluids at normal levels. This is necessary to ensure that the cardiovascular system functions adequately. Daily fluid intake must approximately equal the amount of water lost in sweat, e.g., eight fluid ounces (0.23 liters) of water must be ingested for approximately every eight ounces (0.23 kg) of weight loss. The normal thirst mechanism is not sensitive enough to ensure that enough water will be drunk to replace lost sweat. When heavy sweating occurs, the workers will be encouraged to drink more. The following strategies may be useful:

- Provide drinking water as needed
  - Maintain water temperature at 50 to 60°F (10 to 16.6°C).
  - Provide dedicated personal bottles or containers that hold about 1 quart of water.
  - Dedicated personal bottles of water should be allowed in the Contamination Reduction Zone.
  - Have workers drink 16 ounces (0.5 liters) of fluid (preferably water or diluted drinks) before beginning work.
  - Urge workers to drink a cup or two every 15 to 20 minutes or at each break. A total of 1 to 1.6 gallons (4 to 6 liters) of fluid per person per day are recommended, but more may be necessary to maintain body weight.
  - An additional water source should be maintained outside of Contamination Reduction Zone.
- Train workers to recognize the symptoms of heat-related illnesses. Table 8-2 presents a summary of typical symptoms and treatment of heat stress.
  - Source of water should be available to spray down a person as a measure of preventing or treating heat stress.

### **8.3.2 Cold Stress Monitoring**

When ambient temperature reaches 45°F or below, steps should be taken to prevent cold stress.

Excessive exposure to low environmental air temperatures or immersion in low temperature water are usually fatal unless quickly remedied. Workers must be protected from exposure to cold so that the deep core temperature of the body does not fall below 96.8°F.

Pain in the extremities may be the first early warning of danger to cold stress. Severe shivering may occur if the body temperature drops to 95°F. Workers exhibiting signs of cold stress or hypothermia must get to a warm area until they are safely able to resume their duties.

Table 8-2 Heat Stress Symptoms and Treatment		
Type	Symptoms	Treatment
Heat Related Illness	Localized redness of skin and reduced sweating; reduced tolerance to heat.	Keep skin clean and dry.
Heat Cramps	Muscle spasm and pain in extremities and abdomen.	Remove person to cool area. Give small amounts of salted water.
Heat Exhaustion	Weak pulse; shallow breathing; pale, cool, moist skin; profuse sweating; dizziness; fatigue.	Remove person to cool area, reduce body temperature. Cool by convection. Give small amounts of salted water. Do not allow person to become chilled.
Heat Stroke	Red, hot, dry skin; body temperature of 105°F or greater; nausea; dizziness; confusion; strong rapid pulse; coma. Convulsions may occur.	Seek medical attention immediately. Get victim cool quickly, wrap in wet cloth, spray with cool water, or immerse in cool water. Fan vigorously during transport to hospital. Apply cold packs, if available, avoiding direct contact between skin and pack/ice.

- At air temperatures of 2°C (35.6°F) or less, it is imperative that workers who become immersed in water or whose clothing becomes wet be immediately provided a change of clothing and be treated for hypothermia.
- Provisions for additional total body protection are required if work is performed in an environment at or below 4°C (40°F). The workers shall wear cold protective clothing appropriate for the level of cold and physical activity.
- If only light work is involved and if the clothing on the worker may become wet on the job site, the outer layer of the clothing in use may be of a type impermeable to water. With more severe work under such conditions, the outer layer should be water repellent and their outerwear should be changed as it becomes wetted. The

outer garments must include provisions for easy ventilation in order to prevent wetting of inner layers by sweat. If work is done at normal temperatures or in a hot environment before entering the cold area, the employees shall make sure that their clothing is not wet as a consequence of sweating. If their clothing is wet, the employee shall change into dry clothes before entering the cold area.

- The workers shall change socks and any removable felt insoles at regular daily intervals or use vapor barrier boots. The optimal frequency of changes shall be determined empirically and will vary individually and according to the type of shoe worn and how much the individual's feet sweat.
- If extremities (i.e., ears, toes and nose) cannot be protected sufficiently to prevent sensation of excessive cold or frostbite by handwear, footwear, and face masks, these protective items shall be supplied in auxiliary heated versions.
- If the available clothing does not give adequate protection to prevent hypothermia or frostbite, work shall be modified or suspended until adequate clothing is made available or until weather conditions improve.
- The recommended limits for properly clothed workers for periods of work at temperatures below freezing are listed in Table 8-3.

## **8.4 Decontamination Procedures**

### **8.4.1 General**

All personnel and equipment will be properly decontaminated prior to leaving a site. Decontamination methods could involve (1) physically removing contaminants, (2) neutralizing contaminants by chemical detoxification or disinfection, or (3) removing contaminants through a combination of both physical and chemical means. The types, locations, physical states, and concentrations of contaminations present will determine the degree of decontamination necessary.

As part of the system to prevent these physical transfers of contaminants by people or equipment from onsite to off-site areas, site specific procedures will be instituted for decontaminating all items leaving the Exclusion Zone and the Contamination Reduction Zone. These procedures will include the decontamination of PPE, vehicles, and all field equipment, the use of correct methods of removing PPE to avoid transfer of contaminants from the clothing to the body, and decontamination or disposal. In addition to the decontamination procedures, specific entry and exit routes through the Contamination Reduction Zone will be established for personnel, equipment, and vehicles to minimize the possibilities of additional spread of contaminants. These site specific decontamination procedures are described in the Task HASP.

**Table 8-3**  
**Cold Work Environment Work Practice**

Cooling Power of Wind on Exposed Flesh Expressed as an Equivalent Temperature (under calm conditions)*												
Estimated Wind Speed (in mph)	Actual Temperature Reading (*F)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (*F)											
calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect.)	LITTLE DANGER In <1 hr with dry skin. Maximum danger of false sense of security				INCREASING DANGER Danger from freezing of exposed flesh within 1 minute.				GREAT DANGER Flesh may freeze within 30 seconds.			
	Trenchfoot and immersion foot may occur at any point on this chart.											

\*Developed by U.S. Army Research Institute of Environmental Medicine, Natick, MA.

Work/Warm-up Schedule for Four-Hour Shift*											
Air Temperature-Sunny Sky		No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
°C (approx.)	°F	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks
1. -26° to -28°	-15° to -19°	(Normal Breaks)	1	(Normal Breaks)	1	75 min.	2	55 min.	3	40 min.	4
2. -29° to -31°	-20° to -24°	(Normal Breaks)	1	75 min.	2	55 min.	3	40 min.	4	30 min.	5
3. -32° to -34°	-25° to -29°	75 min.	2	55 min.	3	40 min.	4	30 min.	5	Non-emergency work should cease	
4. -35° to -37°	-30° to -34°	55 min.	3	40 min.	4	30 min.	5	Non-emergency work should cease			
5. -38° to -39°	-35° to -39°	40 min.	4	30 min.	5	Non-emergency work should cease					
6. -40° to -42°	-40° to -44°	30 min.	5	Non-emergency work should cease							
7. -43° & below	-45° & below	Non-emergency work should cease									

**Notes**

- Schedule applies to moderate to heavy work activity with warm-up breaks of ten (10) minutes in a warm location. For Light-to-Moderate Work (limited physical movement): apply the schedule one step lower. For example, at -30°F with no noticeable wind (Step 4), a worker at a job with little physical movement should have a maximum work period of 40 minutes with 4 breaks in a 4-hour period (Step 5).
- The following is suggested as a guide for estimating wind velocity. If accurate information is not available: 5 mph: light flag moves; 10 mph: light flag fully extended; 15 mph: raises newspaper sheet; 20 mph: blowing and drifting snow.
- If only the Wind Chill Factor is available, a rough rule of thumb for applying it rather than the temperature and wind velocity factors given above would be: 1) special warm-up breaks should be initiated at a wind chill of about 1750 W/m<sup>2</sup>/hr, 2) all non-emergency work should have ceased at or before a wind chill of 2250 W/m<sup>2</sup>/hr. In general the warm-up schedule provided above slightly under-compensates for the wind at the warmer temperatures, assuming acclimatization and clothing appropriate for winter work. On the other hand, the chart slightly over-compensates for the absolute temperatures in the colder ranges, since windy conditions rarely prevail at extremely low temperatures.

\*From Occupational Health & Safety Division, Saskatchewan Dept. of Labor.

Equipment that is not decontaminated or not completely decontaminated will be disposed onsite or transferred in a controlled manner for subsequent decontamination in a controlled situation. Such equipment will be bagged or wrapped in plastic for transport to the decontamination location. The outside container of the equipment must be labeled as contaminated and the potential contaminants and associated hazards must be listed. In order to minimize the need to decontaminate equipment, this type of equipment may be packaged or wrapped in a material that will protect it from contamination but does not interfere with its proper operation.

The initial decontamination plan is based upon a nominal case situation. This initial decontamination plan will be modified, adding necessary stations or otherwise adapting it to site conditions when a worst-case situation occurs. Changes in the decontamination plan will be made and noted in the Task HASP by the SSC. If, on visual examination, chemical protective clothing appears grossly contaminated, a thorough decontamination is required.

The SSC is responsible for selecting and monitoring the decontamination procedures to verify their effectiveness of decontamination. When the decontamination procedures are found to be ineffective, appropriate steps will be taken to correct the deficiencies.

Methods that have proven to be effective in removal of contaminants are included in Attachment 8.

#### **8.4.2 Emergency Decontamination**

In a medical emergency, the primary concern is to prevent the loss of life or severe injury to site personnel. Any person who becomes ill or injured in the Exclusion Zone must be decontaminated to the maximum extent possible before providing the necessary first aid or before permitting the person to enter the Support Zone.

If the patient's condition is serious, at least partial decontamination should be completed. This may be accomplished by:

- Complete derobing of the patient and redressing in clean coveralls.
- Wrapping patient in a blanket or plastic.
- Spot decontamination.

If the injury or illness is minor, full decontamination will be completed and first aid administered prior to transport. The SSC will select the degree of needed decontamination in proportion to the potential hazards posed by the contaminants. When a person who is not fully decontaminated requires transportation to the hospital, the SSC will have the surfaces covered with plastic to prevent the spreading of contamination.

First aid should be administered while awaiting an ambulance or paramedics.

### **8.4.3 PPE**

Personnel leaving the Exclusion Zone must remove potential contaminants in an orderly and controlled manner in order to avoid contamination of the person. Primary means of avoiding contamination of the person is to minimize contact with contaminants during site activities. Secondary means is to assume contamination and systematically reduce the contamination prior to doffing.

Personal decontamination involves the sequential doffing of PPE, starting with the most heavily contaminated and working to the least contaminated. This progression, in combination with separating each step of the decontamination procedure by a minimum of 3 feet, ensures contamination decreases as the person moves from one station to another further along the line. Wash and rinse steps may be needed in order to reduce the level of contamination to a level safe to handle. Since it is virtually impossible to prevent the transfer of contaminants on protective clothing to the wearer, thorough decontamination of the chemical protective clothing is necessary. When done effectively, the amount of substance remaining on the chemical protective clothing is greatly reduced and the possibility of transfer is proportionately reduced. Therefore, heavily contaminated disposable chemical protective clothing should be washed and rinsed to minimize the spread of the contaminants during doffing. Unsoiled disposable chemical protective clothing may not require the wash and rinse steps.

Polyethylene plastic sheeting will be placed on the ground in the personal decontamination corridor and the decontamination stations arranged on the top of the plastic. The first station will be located within the Exclusion Zone and will be the station where gross contamination is removed.

As a minimum, the level of protection required for the personnel assisting with personnel decontamination will be the most protective of either Level D or one level less than the level worn in the Exclusion Zone.

The SSC is responsible for monitoring the effectiveness of the decontamination procedures.

### **8.4.4 Instruments**

Instrument decontamination requires that, as a minimum, all external surfaces and surfaces that came in contact with the contaminants be wiped with a cloth dampened with a trisodium phosphate detergent and wiped dry. Contamination should be prevented by packaging or wrapping the instrument in a material that will protect it from contamination but does not interfere with its proper operation.



Instruments that are internally contaminated or not completely decontaminated will be transferred in a controlled manner for subsequent decontamination. Such instruments will be bagged or wrapped in plastic for transfer to the decontamination location. The outside container of the instrument must be labeled as contaminated and potential contaminants and associated hazards must be listed.

#### **8.4.5 Equipment**

Equipment that came in direct contact with the contaminant must be decontaminated and shown to be clean before returning it to the owner or equipment center.

#### **8.4.6 Decontamination Solutions**

The standard decontamination solutions will be a solution of Alconox or equivalent detergent. Generally a solution of trisodium phosphate detergent is sufficient for most site applications. The decontamination solution should be prepared in accordance with the manufacturer's instructions. In general, potable water is a sufficient rinse, although for specific equipment, decontamination may require the use of deionized or distilled water.

Other decontamination solutions are listed in Attachment 8.

#### **8.4.7 Vehicle Decontamination Station**

At sites where drill rigs or other vehicles are used for onsite activities, it may be necessary to construct a vehicle decontamination station (VDS) to prevent the spread of contaminants to off-site locations. Typically, the VDS is a sloping area lined with plastic sheeting and gravel so that decontamination solutions can flow into a lined collection pit, sump, or trench. The pit contents can then be pumped into Department of Transportation (DOT) approved 55 gallon drums or containers for later disposal. Other VDS configurations include plastic sheeting with wood runways to accommodate vehicles.

It is imperative that all vehicles used onsite be thoroughly decontaminated before being allowed to leave the site. Special attention should be paid to the treads or tracks and interior surfaces. Decontamination can be expedited if vehicle interiors are lined with plastic sheeting prior to commencing onsite activities.

When using a central vehicular decontamination station, gross dirt must be removed from the vehicle before leaving the Contamination Reduction Zone.

## **8.5 Disposition of Decontamination Wastes**

All materials and equipment used for decontamination must be disposed of properly. Clothing, tools, buckets, brushes, and other equipment that are contaminated must be secured in containers and labeled. Clothing not completely decontaminated onsite should be double bagged before being removed from the site. Spent decontamination soap/rinse solutions must be transferred to drums which are appropriately labeled and disposed of with other substances onsite.

Commercial laundries or cleaning establishments that clean protective clothing or equipment shall be informed of the potentially harmful effects of exposures to the contaminants.

### **8.5.1 Disposal Procedures**

All wash and rinse water will be transferred to a container that will be covered and labeled as to contents and stored onsite. If 55 gallon drums are used, they will be DOT-approved drums, and lids will be put on all drums in the event of rain and at the close of each work day. Drums will be supported on wood blocks or pallets to reduce corrosion. Means and method of disposal of decontamination solutions will be decided on a case-by-case basis and will be detailed in the Task HASP.

### **8.5.2 Contamination Reduction Corridor Breakdown**

When the Contamination Reduction Corridor is no longer needed, it must be closed down. All disposable clothing and plastic sheeting used during the operation must be double bagged and contained onsite in a labeled DOT-approved drum or container. All wash tubs, pails, containers, etc. must be thoroughly washed, rinsed, and dried prior to removal from the site.

## **8.6 Communications**

Communication systems will be established at the site for both internal and external communication for both routine and emergency operations.

### **8.6.1 Internal Communication**

Internal communication refers to communication between workers operating in the Exclusion Zone or Contamination Reduction Zone or to communication from the Support Zone to these workers. Internal communication will be used to:

- Alert team members to emergency situations.
- Convey safety information (e.g., air time remaining in SCBA, heat stress check, hazards detected).
- Communicate changes in the work to be accomplished.

- Maintain site control.

The internal communication system may include such standard communication devices as radio, audible signals from noise makers, or visual signals from hand or body movements.

Identification of individual workers is necessary to ensure commands are addressed to the right worker. This may be accomplished by one of several methods, depending on the specifics of the site activities.

- Marking the suit with the worker's name.
- Color coding, numbering, or symbols for long-distance identification.
- Use of names for short distance, small work force tasks.

Standard audible and visual communication signals are listed in Section 8.6.3.

### **8.6.2 External Communications**

External communications refers to communication between onsite and off-site personnel.

An external communication system must be maintained in order to:

- Coordinate emergency response efforts with off-site responders.
- Report progress or problems to management.
- Maintain contact with essential off-site personnel.

The primary means of external communication are telephone and radio. Where telephones are not available immediately at the site, all team members will be notified of the location and dialing instructions of the nearest telephone. The correct change and necessary telephone numbers will be made readily available in the Support Zone. If radios are used, their locations will be clearly marked. Clear instructions for their use will be posted with the radios at all times.

If access to external communications takes longer than 5 minutes to reach, the field team will be equipped to have immediate access to emergency response organizations.

Specifics of the internal and external communication methods will be detailed in the Task HASP.

### **8.6.3 Communication Signals**

Purpose: To alert members of emergencies, convey safety information, communicate changes in the work to be accomplished, and to maintain site control.

- Audible Internal Communications (whistle, vehicle horn, personal air horn)

#### Signal

- 1) one long blast
- 2) two short blasts
- 3) two long blasts

#### Definition

evacuate area  
localized problem, be on the alert  
all clear, reentry permitted

4) three short blasts

cease work operations

- Visual Internal Communications (hand signals)

<u>Signal</u>	<u>Definition</u>
1) Hands clutching throat	Out of air/cannot breath
2) Hands on top of head	Need assistance
3) Thumbs up	OK/I am alright/I understand
4) Thumbs down	No/negative
5) Arms waiving upright	Send backup support
6) Grip partners wrist	Exit area immediately
7) Cross arms above head	Cease work operations

#### **8.6.4 Hazard Communication**

The following apply to all chemicals where the chemical concentration exceeds 1% or 0.1% for a carcinogen. This section is applicable to all chemicals brought onsite, used onsite, or present as a contaminant onsite.

All chemicals will be accompanied by a Material Safety Data Sheet (MSDS). All MSDSs will be included in Attachment 3 of the Site HASP and made available to all personnel.

All containers of chemicals will be properly labeled with the chemical name and appropriate hazard warning statement.

All team members will be trained in the following at the initial safety briefing or wherever the presence of the chemicals is identified.

- Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area.
- The physical and health hazards of the chemical in the work area.
- The measures employees can take to protect themselves from these hazards.
- Location of the MSDSs.
- Explanation of the labeling system.

## **8.7 Confined Space Entry Procedures**

BVSPC team members are not authorized to enter confined spaces without written authorization from the BVSPC HSM. Confined spaces are defined as spaces that meet the following criteria.

- Large enough for a person to bodily enter.
- Limited or restricted means of entry or exit.
- Not designed for continuous employee occupancy.

Entry into a confined space must comply with the BVSPC standard operating procedure for entry into confined spaces.

## **9.0 Emergency Action Plan**

In the event of an emergency, the SSC will act as the Emergency Coordinator. The SSC will assess the emergency and determine if onsite resources are capable of responding to the emergency without exceeding the level of training and resources available. Otherwise, emergency response by BVSPC field team members will be to immediately evacuate the site in the event of a non-medical emergency. No member of the field team is permitted to assist in responding to a major non-medical emergency.

### **9.1 Preplanning**

Arrangements will be made with the local response community (i.e., fire department or local response services) for them to respond to emergencies that may occur during site operations. The local response community will be provided information regarding site activities, including the types of operations being conducted at the site, the type and degree of contamination at the site, the location of the work zone, and any other relevant information that may be necessary for an appropriate response. Such information will be provided to a supervisory level representative of the emergency response organization prior to the commencement of site operations.

### **9.2 Reporting Emergencies**

Emergencies of all types must be reported to the SSC immediately through established communication means. If the SSC is not available, report the emergency to the nearest BVSPC supervisory representative.

The SSC will assess the emergency and determine if onsite resources are capable of responding to the emergency without exceeding the level of training and resources available. If off-site emergency response organizations are needed, the appropriate notifications will be made in accordance with the preplanning arrangements made.

### **9.3 Notification**

In the event of an emergency, personnel will take direction from the SSC. The SSC will notify the appropriate emergency response organization necessary to mitigate the emergency. As soon as possible, the SSC will make contact with the BVSPC PM and the BVSPC HSM. If an emergency response organization is notified to respond, the SSC will dispatch a representative to the site entrance to escort the emergency response organization to the emergency scene. The SSC will act as the liaison with the officer-in-charge of the emergency response organization.

## **9.4 Emergency Contacts**

Attachment 1 lists emergency telephone numbers and reporting instructions for ambulance, physician, hospital, poison control center, fire, police, local hazmat team, emergency rescue team, client contact, and site contact. Attachment 1 will be conspicuously posted in the Support Zone. Where phone numbers are not available for the above mentioned organization, the list will so indicate.

The present status and capabilities of emergency response teams that would provide assistance at the time of an emergency is described in the Task HASP.

## **9.5 Fire or Explosion**

In the event of a fire or explosion, the local fire department should be notified immediately. The SSC or designated alternate will advise the fire commander of the location, nature, and identification of the hazardous materials onsite. The SSC will maintain contact with the emergency response organization officer-in-charge.

If it is safe to do so, site personnel may:

- Use fire fighting equipment available onsite to control or extinguish incipient fires.
- Remove or isolate flammable or other hazardous materials they may contribute to the fire.
- Inform the site supervisor immediately.
- Inform the site contact immediately.

## **9.6 Spills or Leaks**

In the event of a spill or a leak, site personnel will:

- Inform the site supervisor immediately.
- Inform the site contact immediately.
- Locate the source of the spillage and stop the flow if it can be done safely.
- Contain the spill.
- Notify the local emergency response organization if the spill cannot be controlled.
- Notify the local fire department if the chemical release has the potential of impacting the public health or environment off-site.
- Request off-site assistance in recovery of spilled material.

If the SSC determines that a situation exists that could threaten human health or the environment outside the site area, the local fire department will be notified immediately. In

accordance with USEPA SARA Title III, the SSC will also immediately notify the National Response Center and the BVSPC PM. The telephone report will include:

- (1) Name and telephone number of reporter.
- (2) Name and address of facility.
- (3) Time and type of incident (e.g., release, fire).
- (4) Name and quantity of materials(s) involved, to the extent known, and the location of the discharge within the facility.
- (5) The extent of injuries, if any.
- (6) The possible hazards to human health, or the environment, outside of the site area.
- (7) Actions the person reporting the discharge proposes to take to contain, clean up, and remove the substance.

## **9.7 Evacuation Procedures**

At each work site, an evacuation route and rally point will be identified. The evacuation route will be selected to direct field personnel away from the Exclusion Zone to the nearest exit. During evacuation, every effort will be made to evacuate each person with their assigned buddy. The evacuation route will avoid high hazard areas and efficiently move personnel away from the emergency site.

The evacuation route will be towards a rally point. The rally point is a common area where all field team members are to meet following an evacuation. The purpose of the rally point is to remove personnel to a location a safe distance away from the emergency and away from high hazard areas and to give the SSC a location where all field personnel can be accounted. In the event of missing personnel, emergency response organizations will be notified immediately. The SSC will offer whatever assistance is requested by the emergency response organizations in the event search and rescue is necessary. In the event that the rally point is proximate to the hazard, the SSC will authorize the evacuees to move to a safer rally point. All personnel will remain at the rally point until authorized to leave by the SSC.

## **9.8 Critique of Response and Follow-up**

A follow-up meeting will be held after any emergency situation to assess the actions taken. The meeting will be attended by the SSC and other individuals as appropriate. A record of the meeting will be kept by the SSC. Recommendations from the meeting will be incorporated into the future responses to emergency situations.



## **10.0 Team Member Responsibilities**

### **10.1 Managerial Responsibility**

#### **10.1.1 Health and Safety Manager**

The health and safety manager (HSM) is responsible for providing the PM with assistance and support with regard to all regulatory and safety aspects of site activity.

#### **10.1.2 Project Manager**

The BVSPC project manager (PM) is responsible for technical direction and overall project administration. As a part of that function, the PM will ensure that, at a minimum, BVSPC's project plans meet OSHA requirements and that the health and safety of all site personnel are a primary concern.

### **10.2 Team Organization/Responsibility**

The following personnel organization is critical to the planned activities at the site. The organizational structure is assigned and will be reviewed and updated periodically, by the PM.

#### **10.2.1 Site Manager**

The BVSPC site manager (SM) is responsible for leading the team in the planned field activities. The responsibilities include close attention to site conditions as they may affect the health and safety of all team members during their onsite activities. The SSC will assist the SM in the site activities.

#### **10.2.2 Site Safety Coordinator**

The site safety coordinator (SSC) has total responsibility for ensuring that the provisions of the site and task HASPs are adequate and implemented in the field. Changing field conditions may require decisions to be made concerning adequate protection programs. Therefore, it is vital that personnel assigned as SSC be experienced and meet the additional training requirements specified by OSHA in 29 CFR 1910.120 and the BVSPC Safety and Health Program. The SSC is also responsible for conducting site inspections on a regular basis to ensure the effectiveness of the site HASP.

### **10.2.3 Field Team**

The field team is the BVSPC team personnel responsible for performing the activities described in the site and task HASPs under the SM's oversight. Each member is expected to handle the assigned duties with attention to the inherent hazards involved. All field team members agree to adhere to the provisions in the site and task HASPs.

## 11.0 Certification

All field team members are required to read and familiarize themselves with the contents of this site HASP and then to document their competency through the entry of a signature and date on the section below. Any changes to the site HASP will be made in accordance with Section 12.0, Record of Changes.

By my signature, I certify that:

- I have read,
- I understand, and
- I will abide by the Health and Safety Plan for the American Chemical Service, Inc. site.

Printed Name	Signature	Date	Affiliation

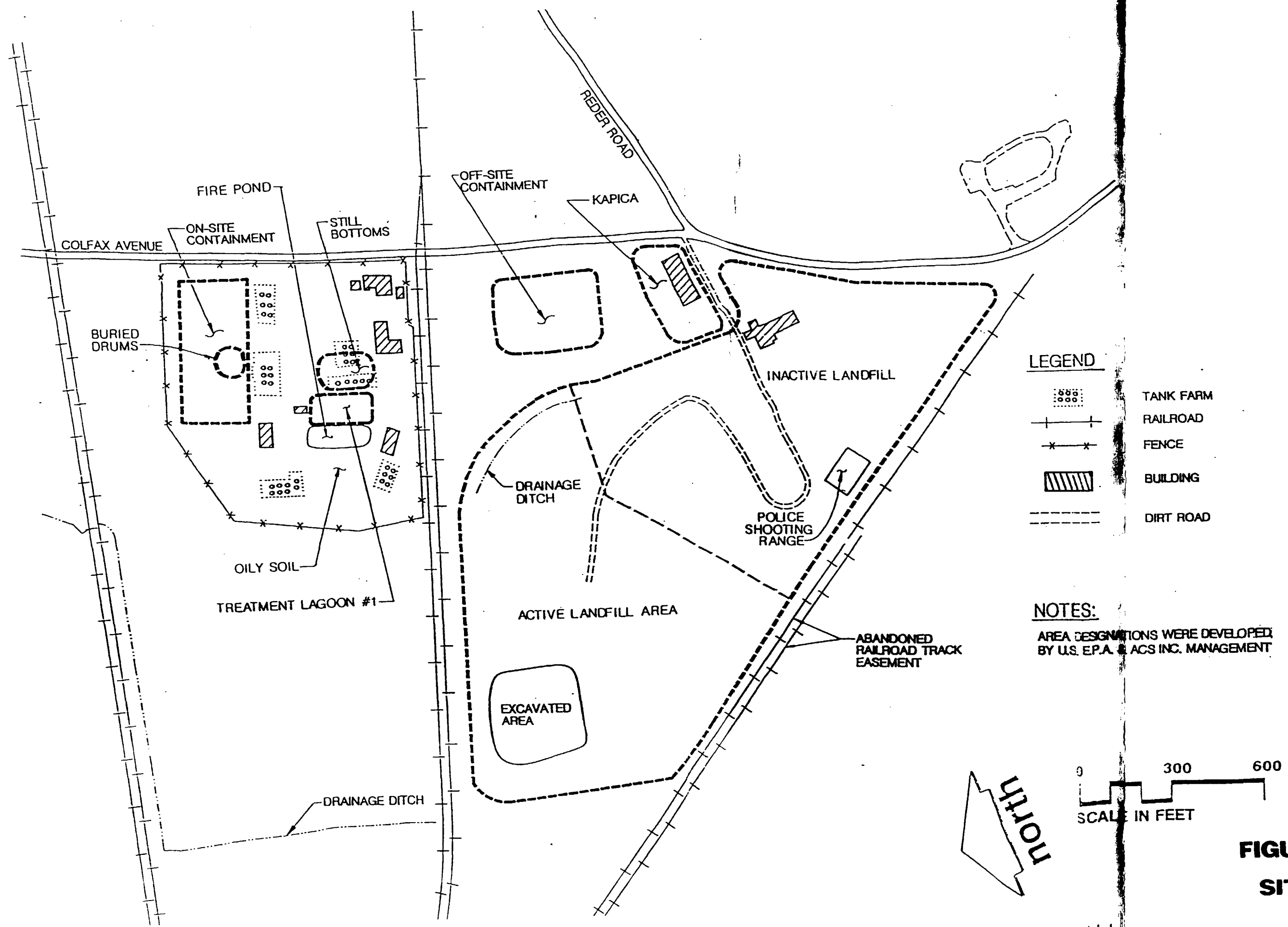
## 12.0 Record of Changes

Changes to this site HASP must be made on the following form and submitted to the BVSPC PM and HSM for their approval. Field activities related to the potential for exposure to contaminants shall be halted until the site HASP has been modified to reflect changed conditions and the BVSPC HSM has reviewed or approved the changes. All field team members who are affected by the changes must initial that they have been apprised of the changes.

Revision Number	Subject	Section/Page	Initials/Date

**Attachment 1**  
**Emergency Information**

**American Chemical Service, Inc.**



**FIGURE A1-1**  
**SITE MAP**

## Hospital Emergency Route

Route to: **Munster Community Hospital**  
901 McArthur Boulevard  
Munster, Indiana  
Phone: (219) 836-1600

See the following page (Figure A1-2) for hospital route.

- From the American Chemical Service, Inc. site proceed north on Colfax Avenue for approximately 1 mile to 45<sup>th</sup> Avenue.
- Turn left (west) onto 45<sup>th</sup> Avenue for approximately 2.5 miles to Calumet Avenue.
- Turn right (north) onto Calumet Avenue and proceed approximately 0.25 mile.
- The hospital emergency entrance is on east (right) side of Calumet Avenue.

## **Hospital Emergency Route**

Route to: **Munster Community Hospital**  
901 McArthur Boulevard  
Munster, Indiana  
Phone: (219) 836-1600

See the following page (Figure A1-2) for hospital route.

- From the American Chemical Service, Inc. site proceed north on Colfax Avenue for approximately 1 mile to 45<sup>th</sup> Avenue.
- Turn left (west) onto 45<sup>th</sup> Avenue for approximately 2.5 miles to Calumet Avenue.
- Turn right (north) onto Calumet Avenue and proceed approximately 0.25 mile.
- The hospital emergency entrance is on east (right) side of Calumet Avenue.



HOSPITAL ROUTE

TOTAL DISTANCE - 8 MILES (ABOUT 15-20 MINUTES)

TO CHICAGO

INTERSTATE I-80/I-94

RIDGE ROAD OR ROUTE 6

MUNSTER  
COMMUNITY  
HOSPITAL

(219) 836-5167  
9003 CALUMET AVE.  
MUNSTER, IN 46321

CALUMET AVE.

INDIANAPOLISE BLVD.

CLINE AVE.

COLFAX AVE.

45th AVE.

MAIN STREET

RAILROAD TRACKS

DIRECTIONS

- \* FROM THE ACS FACILITY, TURN LEFT (NORTH) ON COLFAX AVE.
- \* TURN LEFT (WEST) ON 45th AVE.
- \* TURN RIGHT (NORTH) ON CALUMET AVE.
- \* TURN RIGHT (EAST) INTO THE HOSPITAL

PROJECT OR  
CONTRACTORS  
OFFICE  
AT ACS SITE  
(219) 924-4607  
410 S. COLFAX AVE.  
GRIFFITH, IN 46319

SCALE

NO TO SCALE



BLACK & VEATCH  
Corporation  
Chicago, Illinois

ACS RA GROUP  
AMERICAN CHEMICAL SERVICE SUPERFUND SITE  
GRIFFITH, INDIANA

SITE LOCATION MAP AND  
HOSPITAL ROUTE

FIGURE

A1-2

### Emergency Contacts

Organization	Name	Position	Phone Number
Fire			911 or *999
Hospital	Munster Community Hospital	Emergency Room	(219) 836-1600
Ambulance			911 or *999
Police/Sheriff			911 or *999
BVSPC	Larry Campbell	Project Manager	(312) 346-3775 (w) (847) 593-3680 (h)
	Jack Schill, CIH, CSP	Health and Safety Manager	(802) 644-2841 (w) (802) 644-2865 (h) (816) 718-5779 (cell)
	Shelly Pizzi, OCI	Health and Safety Manager	(913) 458-4516 (w) (913) 707-3934 (cell)
	Diane S. Mettenbrink	Worker's Compensation Administration	(913) 458-8561
Local Provider: U.S. Occupational Health (Chicago BVSPC Medical Records)			
24 Hour Contact: EMR Medical Management Services	Mary Brake		(800) 229-3674
U.S. Environmental Protection Agency	Kevin Adler	USEPA Work Assignment Manager	(312) 886-7078 (w) (630) 261-1627 (h)
USEPA National Response Center			(800) 424-4100
USEPA Regional Response Center			(312) 353-2318
Utilities			(800) 382-5544
Wexford County Emergency Preparedness			(616) 775-7601
Poison Information Center			(800) 442-4571

**Attachment 2**  
**Chemicals of Concern and Applicable Regulatory Standards**

**American Chemical Service, Inc.**

### Chemicals of Concern and Applicable Regulatory Standards at ACS Site

	Contaminant	Exposure Route	TWA Exposure Limits	IDLH	Hazard/Symptoms
Volatiles	Acetone CAS # 67-64-1	Inhalation, Ingestion, Contact	TLV: 500 ppm PEL: 1,000 ppm REL: 250 ppm	2,500 ppm	Irritation of eyes, nose, throat, respiratory system; headaches, dizziness, dermatitis
	1,1-Dichloroethane CAS # 75-34-3	Inhalation, Ingestion, Contact	TLV: 100 ppm PEL: 100 ppm REL: 100 ppm	3,000 ppm	Central nervous system depression; skin irritation; liver and kidney damage
	1,1-Dichloroethene CAS # 75-35-4	Inhalation, skin absorption, ingestion, skin and/or eye contact	TLV: 5 ppm PEL: 1 ppm NIOSH: Carcinogen (LOQ 0.4 ppm)	Not Listed	Irritation eyes, skin, throat; dizziness, headache, nausea, dyspnea (breathing difficulty); liver, kidney disturbance; pneumonitis; [potential occupational carcinogen]
	1,2-Dichloroethane CAS # 107-06-2	Inhalation, Absorption, Ingestion, Contact	TLV: 10 ppm PEL: 50 ppm REL: 1 ppm NIOSH: Carcinogen		Dermatitis, eye damage, nausea, vomiting, mental confusion, dizziness, pulmonary edema; liver, kidney damage
	1,2-Dichloroethene (cis-) CAS # 540-59-0	Inhalation, Ingestion, Contact	TLV: 200 ppm PEL: 200 ppm REL: 200 ppm	1,000 ppm	Irritated eyes, respiratory system; Central nervous system depression
	Benzene CAS # 71-43-2	Inhalation, Skin Absorption, Ingestion, and Skin and/or Eye Contact	TLV: 0.5 ppm PEL: 1 ppm NIOSH REL: 0.1 ppm	500 ppm Carcinogen	Irritation of eyes, nose, respiratory system; giddiness, headaches, nausea; staggered gait; fatigue; lassitude; dermatitis; bone marrow depression; abdominal pain, carcinogen
	2-Butanone (MEK) CAS # 78-93-3	Ingestion, Skin Contact	TLV: 200 ppm PEL: 200 ppm REL: 200 ppm	3,000 ppm	Irritation of eyes, nose; headache, dizziness, vomiting
	Carbon Tetrachloride CAS # 56-23-5	Inhalation, Skin or Eye Absorption, Ingestion	TLV: 10 ppm PEL: 2 ppm	300 ppm Carcinogen	Central nervous system depressant; nausea, vomiting, liver, kidney damage; skin irritant
	Chlorobenzene CAS # 108-90-7	Inhalation, Ingestion, Skin and/or Eye Contact	TLV: 10 ppm PEL: 75 ppm	1,000 ppm	Irritation of skin, eyes, nose; drowsiness, incoordination, liver damage
	Chloroethane CAS # 75-00-3	Inhalation, Absorption, Ingestion, Eye and Skin Contact	TLV: 100 ppm PEL: 1,000 ppm	3,800 ppm	Irritation of eyes, mucous membranes; stomach cramps, dizziness, unconsciousness

### Chemicals of Concern and Applicable Regulatory Standards at ACS Site (Continued)

	Contaminant	Exposure Route	TWA Exposure Limits	IDLH	Hazard/Symptoms
Volatiles (Continued)	Chloroform CAS # 67-66-3	Inhalation, Ingestion, and Skin or Eye Contact	TLV: 10 ppm PEL: 50 ppm REL: 2 ppm	500 ppm Carcinogen	Dizziness, mental dullness, nausea, disorientation; headache, fatigue; anesthesia; eye and skin irritant
	Chloromethane CAS# 74-87-3	Inhalation, Skin Contact	TLV: 50 ppm PEL: 100 ppm	2,000 ppm Carcinogen	Dizziness, drowsiness, confusion, nausea and vomiting, abdominal pains, delirium, convulsions, coma
	1,2-Dichloropropane CAS # 78-87-5	Inhalation, Ingestion, Contact	TLV: 75 ppm PEL: 75 ppm NIOSH: Carcinogen (LOQ 0.03 ppm)	400 ppm	Eye irritation; drowsiness, lightheadedness, irritation skin
	Ethylbenzene CAS # 100-41-4	Inhalation, Ingestion, Skin/Eye Contact	TLV: 100 ppm PEL: 100 ppm REL: 100 ppm	800 ppm	Irritation of eyes, mucous membranes; headache; dermatitis; narcosis, coma
	4-methyl-2-pentanone CAS# 108-10-1	Inhalation, Skin/Eye Contact	TLV: 50 ppm PEL: 100 ppm REL: 50 ppm	500 ppm	Skin Irritation, eye irritation, dizziness, headache, nausea
	Methylene Chloride CAS # 75-09-2	Inhalation, Ingestion, Contact	TLV: 50 ppm PEL: 25 ppm NIOSH: Carcinogen	2,300 ppm	Fatigue, weakness, sleepiness, light-headedness; numb or tingling limbs, nausea, eye irritation
	Styrene CAS # 100-42-5	Inhalation, Ingestion, Contact	TLV: 20 ppm PEL: 100 ppm REL: 50 ppm	700 ppm	Eye, nose, throat irritation; drowsiness; weak unsteady gait; narcosis; defatting dermatitis
	Tetrachloroethene CAS # 127-18-4	Inhalation, Ingestion, Contact	TLV: 25 ppm PEL: 100 ppm NIOSH: Carcinogen	150 ppm	Eye, nose, throat irritation; nausea, flushed face/neck, vertigo, dizziness, incoherence, headache, somnolence
	1,1,2,2-tetrachloroethane CAS # 79-34-5	Inhalation, Skin or Eye Contact and Absorption, and Inhalation	TLV: 1 ppm PEL: 5 ppm REL: 1 ppm (7 mg/m <sup>3</sup> )	100 ppm Carcinogen	Nausea, vomiting, abdominal pain; tremors in fingers; jaundice, enlarged and tender liver; dermatitis; kidney damage
	Toluene CAS # 108-88-3	Inhalation, Absorption, Ingestion, Skin/Eye Contact	TLV: 50 ppm PEL: 200 ppm REL: 100 ppm	500 ppm	Fatigue, weakness; confusion, euphoria, dizziness, headaches; dilated pupils; excess tearing of eyes, nervousness, muscle fatigue, insomnia; abnormal skin sensation, photophobia
	1,1,1-trichloroethane (Methyl chloroform) CAS # 71-55-6	Inhalation, Skin Absorption, Ingestion and Skin or Eye Contact	TLV: 350 ppm PEL: 350 ppm (1900 mg/m <sup>3</sup> ) REL: 350 ppm (1900 mg/m <sup>3</sup> )	700 ppm	Dizziness, incoordination, irritating to eyes, drowsiness, increased reaction time, unconsciousness

### Chemicals of Concern and Applicable Regulatory Standards at ACS Site (Continued)

	Contaminant	Exposure Route	TWA Exposure Limits	IDLH	Hazard/Symptoms
Volatiles (Continued)	Trichloroethene CAS # 79-01-6	Inhalation, Ingestion, Contact	TLV: 50 ppm PEL: 100 ppm REL: 25 ppm NIOSH: Carcinogen	1,000 ppm	Head, vertigo; vision disturbance, tremors, somnolence, nausea, vomiting; irritation eyes; dermatitis; cardiac arrhythmias, paresthesia
	Vinyl Chloride CAS # 75-01-4	Inhalation	TLV: 1 ppm PEL: 1 ppm REL: lowest reliably detectable concentration	Carcinogen	Weakness, abdominal pain, gastro intestinal bleeding; pallor of extremities
	Xylenes (Total) CAS # 1330-20-7	Inhalation, Absorption, Ingestion, Skin/Eye Contact	TLV: 100 ppm PEL: 100 ppm REL: 100 ppm	900 ppm	Dizziness, excitement, drowsiness, incoordination, staggering gait; irritation of eyes, nose, throat; anorexia; nausea; vomiting, abdominal pain
Semivolatiles	1,2-Dihydro- Acenaphthylene (PAH) CAS # 83-32-9	Inhalation, Ingestion	TLV: 0.2 mg/m <sup>3</sup> Human Carcinogen		Irritating to skin and mucous membranes; vomiting; increased incidence of lung cancer
	Anthracene (PAH) CAS # 120-12-7	Inhalation	PEL: 0.2 mg/m <sup>3</sup> Human Carcinogen		Skin irritation; increased incidence of lung cancer
	Benzo[a]anthracene (PAH) CAS # 56-55-3	Inhalation	TLV: 0.1 mg/m <sup>3</sup> Human Carcinogen		Skin irritation; increased incidence of lung cancer
	Benzo[b]fluoranthene (PAH) CAS # 205-99-2	Inhalation	TLV: 0.2 mg/m <sup>3</sup> PEL: 0.2 mg/m <sup>3</sup> Human Carcinogen		Skin irritation; increased incidence of lung cancer
	Benzo[k]fluoranthene (PAH) CAS # 207-08-9	Inhalation	TLV: 0.2 mg/m <sup>3</sup> PEL: 0.2 mg/m <sup>3</sup> REL: 0.1 mg/m <sup>3</sup> Suspected Human Carcinogen		Skin irritation; increased incidence of lung cancer
	Benzo[g,h,i]perylene (PAH) CAS # 191-24-2	Inhalation	TLV: 0.2 mg/m <sup>3</sup>		Irritant to skin and lungs, potential carcinogen
	Benzo[a]pyrene (PAH) CAS # 50-32-8	Inhalation	TLV: 0.2 mg/m <sup>3</sup> PEL: 0.2 mg/m <sup>4</sup>		Irritant to lungs and skin

Chemicals of Concern and Applicable Regulatory Standards at ACS Site (Continued)					
	Contaminant	Exposure Route	TWA Exposure Limits	IDLH	Hazard/Symptoms
Semivolatiles (Continued)	Bis-(2-chloroethyl) ether CAS # 117-81-7	Inhalation	TLV: 5 mg/m <sup>3</sup> PEL: 5 mg/m <sup>3</sup> REL: 5 mg/m <sup>3</sup> Carcinogenic		Irritant to eyes and mucous membranes
	Bis-(2-ethylhexyl) phthalate (Diocetyl Phthalate) CAS # 117-81-7	Inhalation	TLV: 5 mg/m <sup>3</sup> PEL: 5 mg/m <sup>3</sup> REL: 5 mg/m <sup>3</sup> Carcinogenic		Irritant to eyes and mucous membranes
	Chrysene (PAH) CAS # 218-01-9	Inhalation	PEL: 0.2 mg/m <sup>3</sup> Human Carcinogen		Irritant to skin, increased incidence of lung cancer
	Dibenzofuran CAS # 132-64-9	Inhalation, Ingestion, Skin/Eye Contact	Lowest feasible concentration		By analogy treat as dioxin
	Dibenzo(a,h)perylene (PAH) CAS # Unable to locate	Inhalation	TLV: 0.2 mg/m <sup>3</sup> ACGIH		Potentially carcinogenic, irritant to skin and lungs
	1,4-Dichlorobenzene CAS # 106-46-7	Inhalation, Ingestion, Contact	TLV: 10 ppm PEL: 75 ppm NIOSH: Carcinogen (LOQ 1.7 ppm)	150 ppm	Headache; eye irritation, swell periorbital; profuse rhinitis; anorexia, nausea, vomiting, weight loss, jaundice, cirrhosis
	Di-n-butyl phthalate CAS # 84-74-2	Inhalation, Ingestion, Contact	TLV: 5 mg/m <sup>3</sup> PEL: 5 mg/m <sup>3</sup> REL: 5 mg/m <sup>3</sup>	4,000 mg/m <sup>3</sup>	Irritation to upper respiratory tract and stomach
	Dinitrotoluene CAS # 25321-14-6	Inhalation, Ingestion, Contact, Absorption	TLV: 0.2 mg/m <sup>3</sup> PEL: 1.5 mg/m <sup>3</sup> REL: 1.5 mg/m <sup>3</sup> NIOSH: Carcinogen (skin)	50 mg/m <sup>3</sup>	Anoxia, cyanosis, anemia, jaundice
	Fluoranthene (PAH) CAS # 206-44-0	Inhalation	TLV: 0.2 mg/m <sup>3</sup> PEL: 0.2 mg/m <sup>3</sup> REL: 0.1 mg/m <sup>3</sup> Human Carcinogen		Irritant to skin, increased incidence of lung cancer
	Fluorine (PAH) CAS # 7782-41-4	Inhalation	TLV: 1 ppm PEL: 0.2 mg/m <sup>3</sup> REL: 0.1 ppm Human Carcinogen	25 ppm	Irritant to skin, increased incidence of lung cancer

### Chemicals of Concern and Applicable Regulatory Standards at ACS Site (Continued)

	Contaminant	Exposure Route	TWA Exposure Limits	IDLH	Hazard/Symptoms
Semivolatiles (Continued)	Hexachlorobutadiene CAS # 87-68-3	Inhalation, Absorption, Ingestion, Skin Contact	TLV: 0.02 ppm PEL: 0.02 ppm REL: 0.02 ppm Carcinogen, skin	Not Listed	irritation eyes, skin, respiratory system; kidney damage
	Hexachlorobenzene CAS # 118-74-1	Not Listed	TLV: 0.002 mg/m <sup>3</sup>	Not Listed	Not Listed
	Indeno[1,2,3-cd]pyrene CAS # 193-39-5	Inhalation	PEL: 0.2 mg/m <sup>3</sup> Possible Human Carcinogen		Irritant to skin and lungs
	Isophorone CAS # 78-59-1	Inhalation, Ingestion, Contact	PEL: 25 ppm REL: 4 ppm	200 ppm	Irritation to eyes, nose, throat; narcosis; dermatitis
	4-Methylphenol (p-Cresol) CAS # 106-44-5	Inhalation, Absorption, Ingestion, Skin Contact	TLV: 5 ppm PEL: 5 ppm REL: 2.3 ppm	250 ppm	Confusion, depression, respiratory failure/ difficulty, weakness, skin and eye burns, dermatitis
	N-nitrosodiphenylamine CAS # 86-30-6	Not Listed	Not Listed	Not Listed	Not Listed
	Naphthalene CAS # 91-20-3	Inhalation, ingestion, Skin Contact	TLV: 10 ppm REL: 10 ppm PEL: 10 ppm	250 ppm	Eye irritation, headache, confusion, excitement, malaise, nausea, vomiting, abdominal pain, irritation of bladder, profuse sweating, jaundice, kidney shutdown, dermatitis
	Phenanthrene (PAH) CAS # 85-01-8	Inhalation	REL: 0.1 mg/m <sup>3</sup> PEL: 0.2 mg/m <sup>3</sup> Human Carcinogen	80 mg/m <sup>3</sup>	Skin irritation, increased incidence of lung cancer
	Pentachlorophenol CAS # 87-86-5	Inhalation, Absorption, Ingestion, Skin Contact	TLV: 0.5 mg/m <sup>3</sup> PEL: 0.5 mg/m <sup>3</sup> REL: 0.5 mg/m <sup>3</sup>	2.5 mg/m <sup>3</sup>	Irritation to eyes, nose, throat; sneezing, coughing, weakness, anorexia, weight loss, sweating, headache, dizziness, nausea, vomiting
	Pyrene (PAH) CAS # 129-00-0	Inhalation	REL: 0.1 mg/m <sup>3</sup> PEL: 0.2 mg/m <sup>3</sup> Human Carcinogen	80 mg/m <sup>3</sup>	Skin irritation, increased incidence of lung cancer
	1,2,4-Trichlorobenzene CAS # 120-82-1	Inhalation, Absorption, Ingestion, Skin Contact	REL: 5 ppm	Not Listed	Irritation eyes, skin, mucous membrane; in animals: liver, kidney damage; possible teratogenic effects



### Chemicals of Concern and Applicable Regulatory Standards at ACS Site (Continued)

	Contaminant	Exposure Route	TWA Exposure Limits	IDLH	Hazard/Symptoms
Pesticides/ PCBs	Aldrin CAS # 309-00-2	Inhalation, Absorption, Ingestion, Skin Contact	TLV: 0.25 mg/m <sup>3</sup> PEL: 0.25 mg/m <sup>3</sup> REL: 0.25 mg/m <sup>3</sup> skin	25 mg/m <sup>3</sup>	Headaches; dizziness; nausea; vomiting; malaise; myoclonic jerks of limbs; clonic, tonic convulsions; coma
	Alpha Chlordane CAS # 57-74-9	Inhalation, Absorption, Ingestion, Skin/Eye Contact	TLV: 0.5 mg/m <sup>3</sup> PEL: 0.5 mg/m <sup>3</sup> REL: 0.5 mg/m <sup>3</sup> Probable Human Carcinogen	500 mg/m <sup>3</sup>	Blurred vision, confusion, in coordination, delirium, cough, abdominal pain, nausea, vomiting, diarrhea, irritability, tremor, convulsions, failure to urinate
	Aroclor 1248 CAS # 12672-29-6	Skin and/or Eye Contact	REL: 0.001 mg/m <sup>3</sup>		Suspected human carcinogen
	Aroclor 1254 CAS # 11097-69-1	Skin/Eye Contact, Ingestion	TLV: 0.5 mg/m <sup>3</sup> PEL: 0.5 mg/m <sup>3</sup> REL: 0.001 mg/m <sup>3</sup> Carcinogen	5 mg/m <sup>3</sup>	Poison by intravenous routes, moderately toxic by ingestion
	Alpha-BHC CAS# 319-84-6	Inhalation, Skin Contact	Not Listed	Not Listed	Not Listed
	Beta-BHC CAS# 319-85-7	Not Listed	Not Listed	Not Listed	Not Listed
	Gamma-BHC (Lindane) CAS# 58-89-9	Inhalation, Eye and Skin Contact	TLV: 0.5 mg/m <sup>3</sup> PEL: 0.5 mg/m <sup>3</sup>	50 mg/m <sup>3</sup>	Severe headache, nausea, irritation of eyes, nose, and throat, convulsions
	1,1'-(Dichloro-thenylidene) bis[4-chlorobenzene] (DDE) CAS# 72-55-9	Ingestion, Inhalation, Contact	Not Listed	Not Listed	Liver and kidney damage; irritate or burn skin and eyes; dizziness and suffocation; possibly fatal.
	4,4'-Dichlorodiphenyl- trichloroethane (DDT) CAS # 50-29-3	Inhalation, Absorption, Ingestion, Contact	TLV: 1 mg/m <sup>3</sup> PEL: 1 mg/m <sup>3</sup> REL: 0.5 mg/m <sup>3</sup> Probable Human Carcinogen	No IDLH	Abnormal sensation in tongue, lips, face, hands; tremors, apprehension, dizziness, convulsions, vomiting, irritated eyes, skin
	4,4,4-DDD CAS# 72-54-8	Ingestion, Inhalation, Skin Contact	Not Listed	Not Listed	Liver and kidney damage, irritation of nose and throat.

### Chemicals of Concern and Applicable Regulatory Standards at ACS Site (Continued)

	Contaminant	Exposure Route	TWA Exposure Limits	IDLH	Hazard/Symptoms
Pesticides/ PCBs (Continued)	Dieldrin CAS # 60-57-1	Inhalation, Absorption, Ingestion, Contact	TLV: 0.25 mg/m <sup>3</sup> PEL: 0.25 mg/m <sup>3</sup> Probable Human Carcinogen	50 mg/m <sup>3</sup>	Headache, dizziness, nausea, vomiting, malaise, sweating; limb jerking; clonic, tonic convulsions, coma, liver, kidney damage
	Endosulfan I CAS # 115-29-7	Ingestion, Skin Contact	TLV: 0.1 mg/m <sup>3</sup> PEL: 0.1 mg/m <sup>3</sup> REL: 0.1 mg/m <sup>3</sup>	Not Listed	Headache, giddiness, nervousness, blurred vision, weakness, nausea, cramps, diarrhea, and discomfort in the chest
	Heptachlor and Heptachlor Epoxide CAS # 76-44-8	Inhalation, Absorption, Ingestion, Contact	TLV: 0.05 mg/m <sup>3</sup> PEL: 0.5 mg/m <sup>3</sup> Probable Human Carcinogen	700 mg/m <sup>3</sup>	In animals: tremors, convulsions, liver damage
	Polychlorinated Biphenyls (PCBs) CAS # 1336-36-3	Inhalation of fume or vapor, Percutaneous Absorption of liquid, Ingestion, Eye and Skin Contact	REL: 0.001 mg/m <sup>3</sup>	5 mg/m <sup>3</sup> +0 10 mg/m <sup>3</sup>	Local-Prolonged skin contact may cause sebaceous cysts, and pustules, known as chloracne; irritation of eyes, nose, and throat may also occur; systemic-signs and symptoms include edema, jaundice, vomiting, anorexia, nausea, abdominal pains and fatigue
Inorganics	Antimony CAS # 7440-36-0	Inhalation, Contact	TLV: 0.5 mg/m <sup>3</sup> PEL: 0.5 mg/m <sup>3</sup> REL: 0.5 mg/m <sup>3</sup>	50 mg/m <sup>3</sup>	Irritation of nose, throat, mouth; cough; dizziness, headache; nausea, vomiting, diarrhea, stomach cramps; insomnia, anorexia, irritated skin; cardiac abnormalities
	Arsenic CAS # 7440-38-2	Inhalation, Absorption, Contact, Ingestion	TLV: 0.01 mg/m <sup>3</sup> PEL: 0.010 mg/m <sup>3</sup> REL: 0.002 mg/m <sup>3</sup> Human Carcinogen	5 mg/m <sup>3</sup>	Ulceration of nasal septum; dermatitis, gastrointestinal disturbances; peripheral neuropathy; respiratory irritation, hyperpigmentation of skin
	Beryllium CAS # 7440-41-7	Inhalation	TLV: 0.002 mg/m <sup>3</sup> PEL: 0.002 mg/m <sup>3</sup> Probable Human Carcinogen	10 mg/m <sup>3</sup>	Respiratory symptoms, weakness, fatigue; weight loss
	Cadmium CAS # 7440-43-9	Inhalation, Ingestion	TLV: 0.01 mg/m <sup>3</sup> PEL: 0.005 mg/m <sup>3</sup> Probable Human Carcinogen	9 mg/m <sup>3</sup>	Pulmonary edema, dyspnea, cough, chest tightness, substernal pain; headache; chills, muscle aches; nausea, vomiting, diarrhea, mild anemia
	Chromium CAS # 7440-47-3	Inhalation, Ingestion	TLV: 0.5 mg/m <sup>3</sup> PEL: 1 mg/m <sup>3</sup> REL: 0.5 mg/m <sup>3</sup>	250 mg/m <sup>3</sup> as Cr	Histologic fibrosis of lungs, dermatitis, potential carcinogen
	Lead CAS # 7439-92-1	Inhalation, Ingestion, Skin/Eye Contact	TLV: 0.050 mg/m <sup>3</sup> PEL: 0.050 mg/m <sup>3</sup> REL: 0.10 mg/m <sup>3</sup>	100 mg/m <sup>3</sup>	Weakness, lassitude, insomnia, facial pallor, anorexia, low-weight, constipation, abdominal pain, anemia, wrist and ankle paralysis

Chemicals of Concern and Applicable Regulatory Standards at ACS Site (Continued)					
	Contaminant	Exposure Route	TWA Exposure Limits	IDLH	Hazard/Symptoms
Inorganics (Continued)	Manganese CAS # 7439-96-5	Inhalation, Ingestion	TLV: 0.2 mg/m <sup>3</sup> PEL: 1 mg/m <sup>3</sup> Intended Change	50 mg/m <sup>3</sup>	Parkinson's disease, asthenia, insomnia, mental confusion; metal fume fever; dry throat, cough, tight chest, dyspnea, rashes, flu-like fever; low-back pain; vomiting; malaise; fatigue
	Thallium CAS # 7440-28-0	Inhalation, Ingestion, Skin/Eye Contact	TLV: 0.1 mg/m <sup>3</sup> PEL: 0.1 mg/m <sup>3</sup>	20 mg/m <sup>3</sup>	Parkinson's disease, asthenia, insomnia, mental confusion; metal fume fever; dry throat, cough, tight chest, dyspnea, rashes, flu-like fever; low-back pain; vomiting; malaise; fatigue

# Chemicals of Concern and Applicable Regulatory Standards

## Notes and Abbreviations

IDLH Source:	U.S. Department of Health and Human Services, NIOSH Pocket Guide, 1990.
OSHA PEL/Carcinogen/ACGIH TLV Sources:	American Conference of Government Industrial Hygienists, Guide to Occupational Exposure Values 1992.
OSHA PEL:	Occupational Safety and Health Administration Permissible Exposure Limit.
TWA:	Time-weighted average exposure concentration for normal 8-hour (TLV, PEL) or up to a 10-hour (REL) workday and 40-hour workweek.
IDLH	Immediately dangerous to life or health concentrations.
NE	No evidence could be found for the existence of an IDLH.
CNS	Central Nervous System
CVS	Cardiovascular System
PNS	Peripheral Nervous System
GI Tract	Gastrointestinal Tract
RBC	Red Blood Cell
Ing	Ingestion
Inh	Inhalation
Abs	Skin Absorption
Con	Skin and/or eye contact.
skin	Danger of cutaneous absorption.
Carcinogen Designations:	
TLV-A2:	Suspected human carcinogen, based on either limited epidemiologic evidence or demonstration.
EPA-B:	Probable Human Carcinogen; weight of evidence of human carcinogenicity based on epidemiologic studies is limited; agents for which weight of evidence of carcinogenicity based on animal studies is sufficient.
EPA-B-2:	Sufficient evidence from animal studies; inadequate evidence or no data from epidemiologic studies.
IARC-2A	Probably carcinogenic to humans; limited human evidence, sufficient evidence in experimental animals.
IARC-2B	Possibly carcinogenic to humans; limited evidence in humans in the absence of sufficient evidence in experimental animals.
MAK-A1	Capable of inducing malignant tumors as shown by experience with humans.
MAK-A2	Unmistakably carcinogenic in animal experimentation only.
NIOSH-X	Carcinogen defined with no further categorization.
NTP-2	Reasonably anticipated to be a carcinogen; limited evidence from studies in humans or sufficient evidence from studies in experimental animals.

**Attachment 3**  
**Material Safety Data Sheets**

**American Chemical Service, Inc.**

# **MSDS**

## **Table of Contents**

**See Montgomery Watson Harza (MWH) Site Safety Plan**

**Note:** Although these are written by a specific manufacturer, they are not meant in any way to suggest that the waste products or contamination on the site comes from that particular manufacturer. They are intended to be used solely as an approximation for the waste product to provide safety and health hazard information, including symptoms of exposure, first-aid procedures, and spill control measures.

**Attachment 4**  
**Safety Meeting Checklist**

**American Chemical Service, Inc.**

# American Chemical Service, Inc.

## Safety Meeting Checklist

\_\_\_\_\_  
Site Safety Coordinator

\_\_\_\_\_  
Date

Attendee Initials \_\_\_\_\_  
\_\_\_\_\_

SSC Initials

- \_\_\_\_\_ Review Immediate and Pertinent Work Plans
- \_\_\_\_\_ Collect Current Medical Monitoring Certificates
- \_\_\_\_\_ Collect Current Respirator Fit Test Record
  
- \_\_\_\_\_ Collect Current Training Certificates
- \_\_\_\_\_ Hazardous Waste Operations 40 hr (OSHA 1910.120)
- \_\_\_\_\_ Hazardous Waste Operations Refresher (OSHA 1910.120)
- \_\_\_\_\_ Hazardous Waste Operations Supervisor (OSHA 1910.120)
- \_\_\_\_\_ Confined Space Entry
- \_\_\_\_\_ Air Supplied Respirators
- \_\_\_\_\_ Monitoring Equipment (other than BVSPC supplied)
- \_\_\_\_\_ First Aid/CPR
- \_\_\_\_\_ Other
  
- \_\_\_\_\_ Review Standing Safety Orders
- \_\_\_\_\_ Review Personal Protective Equipment Requirements
  
- \_\_\_\_\_ Review Emergency Action Plan
- \_\_\_\_\_ Anticipated Emergency Response Discussed
- \_\_\_\_\_ Identify First Aid/CPR Trained Personnel to Team Members
- \_\_\_\_\_ Personnel Trained to Respond Identified to Team
- \_\_\_\_\_ Review Evacuation and Rally Procedures with Team Members
- \_\_\_\_\_ Conduct Chemical Hazard Training for Team Members
- \_\_\_\_\_ Detection Methods



- \_\_\_\_\_ Protective Measures
- \_\_\_\_\_ Location of MSDS
- \_\_\_\_\_ Labeling System Used Onsite
- \_\_\_\_\_ Signs/Symptoms of Overexposure
  
- \_\_\_\_\_ Review Communication Systems with Team Members
- \_\_\_\_\_ Internal System
- \_\_\_\_\_ External System
  
- \_\_\_\_\_ Review Changes to HASP
- \_\_\_\_\_ Point Out Postings
- \_\_\_\_\_ Emergency Phone List
- \_\_\_\_\_ Hospital Emergency Route\Map
- \_\_\_\_\_ OSHA Poster
- \_\_\_\_\_ HASP
- \_\_\_\_\_ Subcontractor Safety
- \_\_\_\_\_ MSDS Submitted to BVSPC SSC
- \_\_\_\_\_ Emergency Equipment
- \_\_\_\_\_ Reference Materials

Note: If an item is not applicable, insert "N/A".

**Safety briefings are to be held prior to initiating any site activity and at such times as necessary to ensure that employees are apprised of the site safety plan and that the plan is followed.**

**Attachment 5**  
**Medical Monitoring Examination Elements**

**American Chemical Service, Inc.**

## **Medical Monitoring Examination Elements**

### **Baseline**

- Medical History
- Respirator User Assessment
- Assessment for Hazardous Waste Worker
- Physical Examination
- Electrocardiogram (EKG)
- Pulmonary Function Test
- Chest X-ray
- Audiometry
- Vision Screen
- Stool Occult Blood
- Urinalysis
- Hematology
- Blood Chemistry
- Coagulation
- Physician Discretion Exams

### **Annual**

- Baseline (Minus the X-ray)
- Physician Discretion Exams

### **Exit**

- Baseline (Minus EKG and Respirator User Assessment)
- Physician Discretion Exams

### **Physician Discretion Exams**

- Annual Chest X-ray
- Tetanus Booster
- Serum PCB Levels
- RBC Cholinesterase
- Plasma Cholinesterase
- Stress EKG
- 24 hr Dioxin in Urine
- Heavy Metals in Urine

**Attachment 6**  
**Personal Protection Equipment Elements**

**American Chemical Service, Inc.**

**Figure A6-1**

**American Chemical Service, Inc. Site  
Respirator Selection and Hazard Assessment**

- Instructions:
- (1) Complete a "Respirator Selection and Hazard Assessment" for each different task that the employee uses a respirator.
  - (2) Provide a copy of the "Respirator Selection and Hazard Assessment" and any supporting documentation to the SSC.

Project Name:	Name of Assessor:
Project Number:	Worksite Respirator Program Administrator:
Project Location:	Date:

Approval of Black & Veatch Manager of Industrial Hygiene: \_\_\_\_\_ Date: \_\_\_\_\_

Description of task	Number of employees exposed:
---------------------	------------------------------

**Workplace Considerations**

Is there a potential for oxygen deficiency?	
What is the relative humidity (RH) range of the work environment?	<input type="radio"/> <40% RH <input type="radio"/> 41-60% RH <input type="radio"/> 61-80% RH <input type="radio"/> >80% RH
What is the maximum temperature of the work environment?	
What other personal protective equipment is being worn?	
What is the anticipated schedule of use for the respirator?	
What type of work load will the respirator user be working under while wearing the respirator?	<input type="radio"/> light (less than 200 kcal per hour) <sup>1</sup> <input type="radio"/> moderate (200 to 350 kcal per hour) <sup>1</sup> <input type="radio"/> heavy (above 350 kcal per hour) <sup>1</sup>
Other factors that might influence respirator selection or use.	

**Figure A6-1 (Continued)**

**Contaminant Information**

Contaminant of Concern		
Permissible Exposure Level (PEL)		
Threshold Limit Value (TLV)		
Recommended Exposure Limit (REL)		
IDLH		
What is the physical state?		
MMAD or aerosol particle size (microns)		
Is contaminant a fume?		
What is the vapor pressure (mm Hg)		
List any known skin or eye hazards.		
List any warning properties.		
Chemical specific standard exists?		
What is the concentration in the air? <sup>1,2</sup>		
How is the concentration in the air determined? <sup>1</sup>		
Basis for the estimate of the concentration in the air. <sup>1,2</sup>		
Cartridge service life data <sup>2</sup>		
Cartridge desorption studies data <sup>2</sup>		
What is the hazard ratio (airborne/AEL) <sup>2</sup>		
What is the cartridge MUC		
Does the cartridge have an ESLI?		

**Figure A6-1 (Continued)**

**Respirator Selection**

	Air-Purifying Respirator	Air-Supplied Respirator
Make		
Model		
Facepiece		
Helmet or hood		
Assigned protection factor (APF)		
Filter		
Cartridge		
ESLI on cartridge		
Cartridge change schedule for when there is no ESLI		
Source of change schedule objective information or data used to base change schedule		
Positive pressure device		
Demand or pressure-demand		
Breathing air source		
Couplers for breathing air supply		

<sup>1</sup>If a reasonable estimate of employee exposure cannot be made, consider the atmosphere IDLH.

<sup>2</sup> Attach supporting documentation.

**Figure A6-2**  
**American Chemical Service, Inc. Site**  
**OSHA Respirator Medical Evaluation Questionnaire**

Project Name \_\_\_\_\_

Employee Name \_\_\_\_\_ Date \_\_\_\_\_

Employee No. \_\_\_\_\_

**Instructions:**

**To the employer:** Answers to questions in Section 1, and to question 9 in Section 2 of Part A, do not require a medical examination.

**To the employee:** Can you read (circle one): **Yes / No**

You are allowed to answer this questionnaire during normal working hours, or at a time and place that is convenient to you. Every effort will be made to maintain your confidentiality. Your employer or supervisor is instructed not to look at or review your answers. If help is needed in completing the questionnaire, contact the Safety Department. Your employer must tell you how to deliver or send this questionnaire to the physician or licensed health care professional (PLHCP) who will review it.

**OSHA Respirator Medical Evaluation Questionnaire**

**Part A, Section 1. (Mandatory)** The following information must be provided by every employee who has been selected to use any type of respirator (please print):

1. Today's date: \_\_\_\_\_
2. Your name: \_\_\_\_\_
3. Your age (to nearest year): \_\_\_\_\_
4. Sex (circle one): Male/Female
5. Your height: \_\_\_\_\_ ft. \_\_\_\_\_ in.
6. Your weight: \_\_\_\_\_ lbs.
7. Your job title: \_\_\_\_\_
8. A phone number where you can be reached by the health care professional who reviews this questionnaire (include the Area Code): \_\_\_\_\_ (\_\_\_\_) \_\_\_\_\_
9. The best time to phone you at this number: \_\_\_\_\_
10. Has your employer told you how to contact the health care professional who will review this questionnaire (circle one): \_\_\_\_\_ **Yes/No**
11. Check the type of respirator you will use (you can check more than one category):
  - a. N, R, or P disposable respirator (filter-mask, noncartridge type only).
  - b. Other type (for example, half- or full-facepiece type, powered air-purifying, supplied-air, self contained breathing apparatus).



Figure A6-2 (Continued)

12. Have you worn a respirator (circle one): Yes/No

If "yes," what type(s): \_\_\_\_\_

**Part A, Section 2. (Mandatory)** Questions 1 through 9 below must be answered by every employee who has been selected to use any type of respirator (please circle "yes" or "no").

1. Do you currently smoke tobacco, or have you smoked tobacco in the last month? Yes/No

2. Have you ever had any of the following conditions?

- |   |        |
|---|--------|
| a. Seizures (fits):                                       | Yes/No |
| b. Diabetes (sugar disease):                              | Yes/No |
| c. Allergic reactions that interfere with your breathing: | Yes/No |
| d. Claustrophobia (fear of closed-in places):             | Yes/No |
| e. Trouble smelling odors:                                | Yes/No |

3. Have you ever had any of the following pulmonary or lung problems?

- |  |        |
|--|--------|
| a. Asbestosis:   | Yes/No |
| b. Asthma:   | Yes/No |
| c. Chronic bronchitis:                                 | Yes/No |
| d. Emphysema:  | Yes/No |
| e. Pneumonia:  | Yes/No |
| f. Tuberculosis:                                       | Yes/No |
| g. Silicosis:  | Yes/No |
| h. Pneumothorax (collapsed lung):                      | Yes/No |
| i. Lung cancer:  | Yes/No |
| j. Broken ribs:  | Yes/No |
| k. Any chest injuries or surgeries:                    | Yes/No |
| l. Any other lung problem that you've been told about: | Yes/No |

4. Do you currently have any of the following symptoms of pulmonary or lung illness?

- |  |        |
|--|--------|
| a. Shortness of breath:  | Yes/No |
| b. Shortness of breath when walking fast on level ground or walking up a slight hill or incline: | Yes/No |
| c. Shortness of breath when walking with other people at an ordinary pace on level ground:       | Yes/No |
| d. Have to stop for breath when walking at your own pace on level ground:                        | Yes/No |
| e. Shortness of breath when washing or dressing yourself:  | Yes/No |
| f. Shortness of breath that interferes with your job:  | Yes/No |
| g. Coughing that produces phlegm (thick sputum):   | Yes/No |
| h. Coughing that wakes you early in the morning:   | Yes/No |
| i. Coughing that occurs mostly when you are lying down:  | Yes/No |

**Figure A6-2 (Continued)**

- j. Coughing up blood in the last month: Yes/No
- k. Wheezing: Yes/No
- l. Wheezing that interferes with your job: Yes/No
- m. Chest pain when you breathe deeply: Yes/No
- n. Any other symptoms that you think may be related to lung problems: Yes/No
5. Have you ever had any of the following cardiovascular or heart problems?
- a. Heart attack: Yes/No
- b. Stroke: Yes/No
- c. Angina: Yes/No
- d. Heart failure: Yes/No
- e. Swelling in your legs or feet (not caused by walking): Yes/No
- f. Heart arrhythmia (heart beating irregularly): Yes/No
- g. High blood pressure: Yes/No
- h. Any other heart problem that you've been told about: Yes/No
6. Have you ever had any of the following cardiovascular or heart symptoms?
- a. Frequent pain or tightness in your chest: Yes/No
- b. Pain or tightness in your chest during physical activity: Yes/No
- c. Pain or tightness in your chest that interferes with your job: Yes/No
- d. In the past two years, have you noticed your heart skipping or missing a beat: Yes/No
- e. Heartburn or indigestion that is not related to eating: Yes/No
- f. Any other symptoms that you think may be related to heart or circulation problems: Yes/No
7. Do you currently take medication for any of the following problems?
- a. Breathing or lung problems: Yes/No
- b. Heart trouble: Yes/No
- c. Blood pressure: Yes/No
- d. Seizures (fits): Yes/No
8. If you've used a respirator, have you ever had any of the following problems?  
(If you've never used a respirator, check the following space and go to Question 9: \_\_\_\_\_)
- a. Eye irritation: Yes/No
- b. Skin allergies or rashes: Yes/No
- c. Anxiety: Yes/No
- d. General weakness or fatigue: Yes/No
- e. Any other problem that interferes with your use of a respirator: Yes/No
9. Would you like to talk to the health care professional who will review this questionnaire about your answers to this questionnaire: Yes/No

**Figure A6-2 (Continued)**

Questions 10 to 15 below must be answered by every employee who has been selected to use either a full-facepiece respirator or a self-contained breathing apparatus (SCBA). For employees who have been selected to use other types of respirators, answering these questions is voluntary:

- |     |   |        |
|-----|---|--------|
| 10. | Have you ever lost vision in either eye (temporarily or permanently):         | Yes/No |
| 11. | Do you currently have any of the following vision problems?                   |        |
| a.  | Wear contact lenses:  | Yes/No |
| b.  | Wear glasses:   | Yes/No |
| c.  | Color blind:  | Yes/No |
| d.  | Any other eye or vision problem:  | Yes/No |
| 12. | Have you ever had an injury to your ears, including a broken ear drum:        | Yes/No |
| 13. | Do you currently have any of the following hearing problems?                  |        |
| a.  | Difficulty hearing:   | Yes/No |
| b.  | Wear a hearing aid:   | Yes/No |
| c.  | Any other hearing or ear problem:   | Yes/No |
| 14. | Have you ever had a back injury:  | Yes/No |
| 15. | Do you currently have any of the following musculoskeletal problems?          |        |
| a.  | Weakness in any of your arms, hands, legs, or feet:                           | Yes/No |
| b.  | Back pain:  | Yes/No |
| c.  | Difficulty fully moving your arms and legs:                                   | Yes/No |
| d.  | Pain or stiffness when you lean forward or backward at the waist:             | Yes/No |
| e.  | Difficulty fully moving your head up or down:                                 | Yes/No |
| f.  | Difficulty fully moving your head side to side:                               | Yes/No |
| g.  | Difficulty bending at your knees:   | Yes/No |
| h.  | Difficulty squatting to the ground:   | Yes/No |
| i.  | Climbing a flight of stairs or a ladder carrying more than 25 lb.:            | Yes/No |
| j.  | Any other muscle or skeletal problem that interferes with using a respirator: | Yes/No |

**Part B.** Any of the following questions, and other questions not listed, may be added to the questionnaire at the discretion of the health care professional who will review the questionnaire:

- |    |  |        |
|----|--|--------|
| 1. | In your present job, are you working at high altitudes (over 5,000 feet) or in a place that has lower than normal amounts of oxygen:   | Yes/No |
|    | If "yes," do you have feelings of dizziness, shortness of breath, pounding in your chest, or other symptoms when you're working under these conditions:  | Yes/No |
| 2. | At work or at home, have you ever been exposed to hazardous solvents, hazardous airborne chemicals (e.g., gases, fumes, or dust), or have you come into skin contact with hazardous chemicals: | Yes/No |
|    | If "yes," name the chemicals if you know them:   |        |
-

**Figure A6-2 (Continued)**

3. Have you ever worked with any of the materials, or under any of the conditions, listed below:
- |   |        |
|---|--------|
| a. Asbestos:  | Yes/No |
| b. Silica (e.g., in sandblasting):                            | Yes/No |
| c. Tungsten/cobalt (e.g., grinding or welding this material): | Yes/No |
| d. Beryllium:   | Yes/No |
| e. Aluminum:  | Yes/No |
| f. Coal (for example, mining):                                | Yes/No |
| g. Iron:  | Yes/No |
| h. Tin:   | Yes/No |
| i. Dusty environments:  | Yes/No |
| j. Any other hazardous exposures:                             | Yes/No |
- If "yes," describe these exposures
4. List any second jobs or side businesses you have:
- 
5. List your previous occupations:
- 
6. List your current and previous hobbies:
- 
7. Have you been in the military services? Yes/No
- If "yes," were you exposed to biological or chemical agents (either in training or combat): Yes/No
8. Have you ever worked on a HAZMAT team? Yes/No
9. Other than medications for breathing and lung problems, heart trouble, blood pressure, and seizures mentioned earlier in this questionnaire, are you taking any other medications for any reason (including over-the-counter medications): Yes/No
- If "yes," name the medications if you know them:
- 
10. Will you be using any of the following items with your respirator(s)?
- |  |        |
|--|--------|
| a. HEPA filters:                       | Yes/No |
| b. Canisters (for example, gas masks): | Yes/No |
| c. Cartridges:                         | Yes/No |
11. How often are you expected to use the respirator(s) (circle "yes" or "no" for all answers that apply to you)?
- |                                |        |
|--------------------------------|--------|
| a. Escape only (no rescue):    | Yes/No |
| b. Emergency rescue only:      | Yes/No |
| c. Less than 5 hours per week: | Yes/No |
| d. Less than 2 hours per day:  | Yes/No |
| e. 2 to 4 hours per day:       | Yes/No |
| f. Over 4 hours per day:       | Yes/No |

**Figure A6-2 (Continued)**

12. During the period you are using the respirator(s), is your work effort:
- a. Light (less than 200 kcal per hour): **Yes/No**
- If "yes," how long does this period last during the average shift: \_\_\_\_ hrs. \_\_\_\_ min.
- (Examples of light work effort are sitting while writing, typing, drafting, or performing light assembly work; or standing while operating a drill press (1-3 lbs.) or controlling machines.)
- b. Moderate (200 to 350 kcal per hour): **Yes/No**
- If "yes," how long does this period last during the average shift: \_\_\_\_ hrs. \_\_\_\_ min.
- (Examples of moderate work effort are sitting while nailing or filing; driving a truck or bus in urban traffic; standing while drilling, nailing, performing assembly work, or transferring a moderate load (about 35 lbs.) at trunk level; walking on a level surface about 2 mph or down a 5 degree grade about 3 mph; or pushing a wheelbarrow with a heavy load (about 100 lbs.) on a level surface.)
- c. Heavy (above 350 kcal per hour): **Yes/No**
- If "yes," how long does this period last during the average shift: \_\_\_\_ hrs. \_\_\_\_ min.
- (Examples of heavy work are lifting a heavy load (about 50 lbs.) from the floor to your waist or shoulder; working on a loading dock; shoveling; standing while bricklaying or chipping castings; walking up an 8 degree grade about 2 mph; climbing stairs with a heavy load (about 50 lbs.).)
13. Will you be wearing protective clothing and/or equipment (other than the respirator) when using your respirator: **Yes/No**
- If "yes," describe this protective clothing and/or equipment:
- \_\_\_\_\_
14. Will you be working under hot conditions (temperature exceeding 77° F): **Yes/No**
15. Will you be working under humid conditions: **Yes/No**
16. Describe the work you'll be doing while you're using your respirator(s):
- \_\_\_\_\_
17. Describe any special or hazardous conditions you might encounter when you're using your respirator(s) (for example, confined spaces, life-threatening gases):
- \_\_\_\_\_
18. Provide the following information, if you know it, for each toxic substance that you'll be exposed to when you're using your respirator(s):
- a. Name of the first toxic substance: \_\_\_\_\_
- Estimated maximum exposure level per shift: \_\_\_\_\_
- Duration of exposure per shift: \_\_\_\_\_
- b. Name of the second toxic substance: \_\_\_\_\_
- Estimated maximum exposure level per shift: \_\_\_\_\_

**Figure A6-2 (Continued)**

Duration of exposure per shift: \_\_\_\_\_

c. Name of the third toxic substance: \_\_\_\_\_

Estimated maximum exposure level per shift: \_\_\_\_\_

Duration of exposure per shift: \_\_\_\_\_

d. The name of any other toxic substances that you'll be exposed to while using your respirator: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

19. Describe any special responsibilities you'll have while using your respirator(s) that may affect the safety and well-being of others (for example, rescue, security): \_\_\_\_\_

**Figure A6-3**  
**American Chemical Service, Inc. Site**  
**Respirator User Medical Determination**

Project Name: \_\_\_\_\_

Employee Name: \_\_\_\_\_

Date: \_\_\_\_\_

Employee No. : \_\_\_\_\_

Medical Determination Method:	exam	questionnaire
-------------------------------	------	---------------

- The employee (is/is not) medically able to use a respirator.  
If not, state reasons: \_\_\_\_\_
- List any medical limitations on respirator use related to medical conditions of the employee:  
\_\_\_\_\_  
\_\_\_\_\_
- List any limitations on respirator use related to the workplace conditions in which the respirator will be used: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
- State any need for follow-up medical evaluations: \_\_\_\_\_  
\_\_\_\_\_

The employee (is/is not) able to wear a negative pressure respirator due to medical conditions.

The employee (is/is not) able to wear a powered air-purifying respirator.

The physician or licensed health care provider (PLHCP) has provided me with a copy of the PLHCP written recommendations.
--

Employee Signature:
---------------------

PLHCP Signature:
------------------

**Figure A6-4**  
**American Chemical Service, Inc. Site**  
**Qualitative Respirator Fit Test Record**

**A. Test Subject**

Name \_\_\_\_\_ Soc. Sec. No. \_\_\_\_\_  
 Job Title \_\_\_\_\_ Employer \_\_\_\_\_

**B. Respirator**

Type \_\_\_\_\_ Make \_\_\_\_\_  
 NIOSH  
 Model \_\_\_\_\_ Approval No. \_\_\_\_\_

**C. Respirator Fit Test Protocol**

☐ Isoamyl Acetate ☐ Bitrex TM ☐ Saccharin ☐ Irritant Smoke

**D. 5 Minute Comfort Assessment (Items 5-6)** ☐ Pass ☐ Fail

**E. Seal Checks Performed** ☐ Positive Pressure ☐ Negative Pressure

**F. Clean Facial Sealing Surfaces (Item 9)** ☐ Yes ☐ No

**G. Safety Equipment Worn with Respirator (Item 13)**

List: \_\_\_\_\_

**H. Odor Threshold Screening (See OSHA 1910.134 Appendix A)**

	Jar #1		Jar #2		Whiff	
Fit Test Protocol	Detect	Nondetect	Detect	Nondetect	Detect	Nondetect
Isoamyl Acetate						
Bitrex TM						
Saccharin						
Irritant Smoke						

**I. Exercise Regimen (Item 14). All exercises are for 1 minute.**

Normal Breathing (Item 14.1) ☐ Pass ☐ Fail  
 Deep Breathing (Item 14.2) ☐ Pass ☐ Fail  
 Turning Head Side to Side (Item 14.3) ☐ Pass ☐ Fail  
 Moving Head Up and Down (Item 14.4) ☐ Pass ☐ Fail  
 Talking (Item 14.5) ☐ Pass ☐ Fail  
 Bending Over (Item 14.6) ☐ Pass ☐ Fail  
 Normal Breathing (Item 14.7) ☐ Pass ☐ Fail

**J. Employee Tested** \_\_\_\_\_ **Date** \_\_\_\_\_  
 Signature

**Tester** \_\_\_\_\_ **Date** \_\_\_\_\_  
 Signature



## **Figure A6-4 (Continued)**

### **Qualitative Fit Test Procedures—General Requirements**

1. The test subject shall be allowed to pick the most acceptable respirator from a sufficient number of respirator models and sizes so that the respirator is acceptable to, and correctly fits, the user.
2. Prior to the selection process, the test subject shall be shown how to put on a respirator, how it should be positioned on the face, how to set strap tension and how to determine an acceptable fit. A mirror shall be available to assist the subject in evaluating the fit and positioning of the respirator. This instruction may not constitute the subject's formal training on respirator use, because it is only a review.
3. The test subject shall be informed that he/she is being asked to select the respirator that provides the most acceptable fit. Each respirator represents a different size and shape, and if fitted and used properly, will provide adequate protection.
4. The test subject shall be instructed to hold each chosen facepiece up to his/her face and eliminate those that obviously do not give an acceptable fit.
5. The more acceptable facepieces are noted in case the one selected proves unacceptable; the most comfortable mask is donned and worn at least 5 minutes to assess comfort. Assistance in assessing comfort can be given by discussing the points in the following Item 6. If the test subject is not familiar with using a particular respirator, the test subject shall be directed to don the mask several times and to adjust the straps each time, to become adept at setting proper tension on the straps.
6. Assessment of comfort shall include a review of the following points with the test subject and allowing the test subject adequate time to determine the comfort of the respirator:
  - (a) Position of the mask on the nose.
  - (b) Room for eye protection.
  - (c) Room to talk.
  - (d) Position of the mask on face and cheeks.
7. The following criteria shall be used to help determine the adequacy of the respirator fit:
  - (a) Chin properly placed.
  - (b) Adequate strap tension, not overly tightened.
  - (c) Fit across nose bridge.
  - (d) Respirator of proper size to span distance from nose to chin.
  - (e) Tendency of respirator to slip.
  - (f) Self-observation in mirror to evaluate fit and respirator position.
8. The test subject shall conduct a user seal check, using either a negative and positive pressure seal check or those recommended by the respirator manufacturer which provide equivalent protection. Before conducting the negative and positive pressure checks, the subject shall be told to seat the mask on the face by moving the head from side-to-side and up and down slowly while taking in a few slow deep breaths. Another facepiece shall be selected and retested if the test subject fails the user seal check tests.
9. The test shall not be conducted if there is any hair growth between the skin and the facepiece sealing surface, such as stubble beard growth, beard, mustache or sideburns which cross the respirator sealing surface. Any type of apparel which interferes with a satisfactory fit shall be altered or removed.
10. If a test subject exhibits difficulty in breathing during the tests, she or he shall be referred to a physician or other licensed health care professional, as appropriate, to determine whether the test subject can wear a respirator while performing her or his duties.

11. If the employee finds the fit of the respirator unacceptable, the test subject shall be given the opportunity to select a different respirator and to be retested.
12. Exercise regimen. Prior to the commencement of the fit test, the test subject shall be given a description of the fit test and the test subject's responsibilities during the test procedure. The description of the process shall include a description of the test exercises that the subject will be performing. The respirator to be tested shall be worn for at least 5 minutes before the start of the fit test.
13. The fit test shall be performed while the test subject is wearing any applicable safety equipment that may be worn during actual respirator use which could interfere with respirator fit.
14. Test Exercises. The following test exercises are to be performed for all fit testing methods.
  - (a) The test subject shall perform exercises, in the test environment, in the following manner:
    - (1) Normal breathing. In a normal standing position, without talking, the subject shall breathe normally.
    - (2) Deep breathing. In a normal standing position, the subject shall breathe slowly and deeply, taking caution so as not to hyperventilate.
    - (3) Turning head side-to-side. Standing in place, the subject shall slowly turn his/her head from side-to-side between the extreme positions on each side. The head shall be held at each extreme momentarily so the subject can inhale at each side.
    - (4) Moving head up and down. Standing in place, the subject shall slowly move his/her head up and down. The subject shall be instructed to inhale in the up position (i.e., when looking toward the ceiling).
    - (5) Talking. The subject shall talk out loud slowly and loud enough so as to be heard clearly by the test conductor. The subject can read from a prepared text such as the Rainbow Passage, count backward from 100, or recite a memorized poem or song.

#### **Rainbow Passage**

**When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow.**

- (6) Bending over. The test subject shall bend at the waist as if he/she were to touch his/her toes. Jogging in place shall be substituted for this exercise in those test environments such as shroud type QNFT or QLFT units that do not permit bending over at the waist.
    - (7) Normal breathing. Same as Exercise (1).
  - (b) Each test exercise shall be performed for 1 minute. The test subject shall be questioned by the test conductor regarding the comfort of the respirator upon completion of the protocol. If it has become unacceptable, another model of respirator shall be tried. The respirator shall not be adjusted once the fit test exercises begin. Any adjustment voids the test, and the fit test must be repeated.

**Figure A6-5**  
**American Chemical Service, Inc. Site**  
**User Seal Check Procedures**

The individual who uses a tight-fitting respirator is to perform a user seal check to ensure that an adequate seal is achieved each time the respirator is put on. Either the positive and negative pressure checks listed below or the respirator manufacturers' recommended user seal check method shall be used. User seal checks are not substitutes for qualitative or quantitative fit tests.

**I. Facepiece Positive and Negative Pressure Checks**

**A. Positive pressure check.**

Close off the exhalation valve and exhale gently into the facepiece. The face fit is considered satisfactory if a slight positive pressure can be built up inside the facepiece without any evidence of outward leakage of air at the seal. For most respirators, this method of leak testing requires the wearer to first remove the exhalation valve cover before closing off the exhalation valve, and then carefully replace it after the test.

**B. Negative pressure check.**

Close off the inlet opening of the canister or cartridge(s) by covering with the palm of the hand(s) or by replacing the filter seal(s), inhale gently so that the facepiece collapses slightly, and hold the breath for 10 seconds. The design of the inlet opening of some cartridges cannot be effectively covered with the palm of the hand. The test can be performed by covering the inlet opening of the cartridge with a thin latex or nitrile glove. If the facepiece remains in its slightly collapsed condition and no inward leakage of air is detected, the tightness of the respirator is considered satisfactory.

**II. Manufacturer's Recommended User Seal Check Procedures**

The respirator manufacturer's recommended procedures for performing a user seal check may be used instead of the positive or negative pressure check procedures, provided that the Black & Veatch worksite respiratory protection program administrator demonstrates that the manufacturer's procedures are equally effective in the written worksite specific procedures.

**Figure A6-6**  
**American Chemical Services, Inc**  
**Respirator Cleaning Procedures**

These procedures are provided for employer use when cleaning respirators. They are general in nature, and as an alternative, the employer may use the cleaning recommendations provided by the manufacturer of the respirators used by their employees, provided such procedures are as effective as those listed herein. Equivalent effectiveness simply means that the procedures used must accomplish the objectives set forth in this figure; i.e., must ensure that the respirator is properly cleaned and disinfected in a manner that prevents damage to the respirator and does not cause harm to the user.

**I. Procedures for Cleaning Respirators**

- A. Remove filters, cartridges, or canisters. Disassemble facepieces by removing speaking diaphragms, demand and pressure-demand valve assemblies, hoses, or any components recommended by the manufacturer. Discard or repair any defective parts.
- B. Wash components in warm (43° C [110° F] maximum) water with a mild detergent or with a cleaner recommended by the manufacturer. A stiff bristle (not wire) brush may be used to facilitate the removal of dirt.
- C. Rinse components thoroughly in clean, warm (43° [110° F] maximum), preferably running water. Drain.
- D. When the cleaner used does not contain a disinfecting agent, respirator components should be immersed for 2 minutes in one of the following:
  - 1. Hypochlorite solution (50 ppm of chlorine) made by adding approximately 1 milliliter of laundry bleach to 1 liter of water at 43° C (110° F);
  - 2. Aqueous solution of iodine (50 ppm iodine) made by adding approximately 0.8 milliliter of tincture of iodine (6-8 grams ammonium and/or potassium iodide/100 cc of 45 percent alcohol) to 1 liter of water at 43° C (110° F); or
  - 3. Other commercially available cleansers of equivalent disinfectant quality when used as directed, if their use is recommended or approved by the respirator manufacturer.
- E. Rinse components thoroughly in clean, warm (43° [110° F] maximum), preferably running water. Drain. The importance of thorough rinsing cannot be overemphasized. Detergents and disinfectants that dry on facepieces may result in dermatitis. In addition, some disinfectants may cause deterioration of rubber or corrosion of metal parts if not completely removed.
- F. Components should be hand-dried with a clean lint-free cloth or air dried.
- G. Reassemble facepiece, replacing filters, cartridges, and canisters, where necessary.
- H. Test the respirator to ensure that all components work properly.
- I. Properly store the respirator in a plastic bag or equivalent container.



**Figure A6-8**  
**Information for Employees Voluntarily Using Respirators**

Respirators are an effective method of protection against designated hazards, when properly selected and worn. Respirator use is encouraged, even when exposures are below the exposure limit, to provide an additional level of comfort and protection for workers. However, if a respirator is used improperly or not kept clean, the respirator itself can become a hazard to the worker. Sometimes, workers may wear respirators to avoid exposures to hazards, even if the amount of hazardous substance does not exceed the limits set by OSHA standards. If you choose to use a respirator voluntarily, you need to take certain precautions to be sure that the respirator itself does not present a hazard.

You should do the following:

1. Read and heed all instructions provided by the manufacturer on use, maintenance, cleaning and care, and warnings regarding the respirator's limitations.
2. Choose respirators certified for use to protect against the contaminant of concern. NIOSH, the National Institute for Occupational Safety and Health of the U.S. Department of Health and Human Services, certifies respirators. A label or statement of certification should appear on the respirator or respirator packaging. It will tell you what the respirator is designed for and how much it will protect you.
3. Do not wear your respirator into atmospheres containing contaminants for which your respirator is not designed to protect against. For example, a respirator designed to filter dust particles will not protect you against gases, vapors, or very small solid particles of fumes or smoke. For assistance in selecting a respirator, contact your worksite respiratory protection program administrator. Keep track of your respirator so that you do not mistakenly use someone else's respirator.

Employee signature: \_\_\_\_\_ Date: \_\_\_\_\_

**Figure A6-9**

**American Chemical Service, Inc**

**Noise Level Survey Record**

Date Survey Taken: \_\_\_\_\_

Location: \_\_\_\_\_

\_\_\_\_\_

Number of Personnel Exposed: \_\_\_\_\_

Wearing Ear Protection:

\_\_\_\_\_ Yes \_\_\_\_\_ No

Time Survey was Taken: \_\_\_\_\_

Instrument Used: \_\_\_\_\_

Approximate Exposure Time: \_\_\_\_\_

Instrument ID No. \_\_\_\_\_

Calibration: \_\_\_\_\_

Give Details of the Survey:

Diagram of Survey Area:

Recommendations:

Survey Taken By: \_\_\_\_\_

**Attachment 7**  
**Monitoring Equipment Action Levels**  
**American Chemical Service, Inc.**



Monitoring Equipment Action Levels		
Instrument	Reading	Action
O <sub>2</sub> Meter (measure at source for LEL Meter, in breathing zone for PPE).	Less than 19.5% O <sub>2</sub>	Withdraw. Ventilate with fresh air. Explosimeter readings <u>not</u> valid if O <sub>2</sub> <10%.
	Greater than 23% O <sub>2</sub>	Withdraw. Explosion hazard. Consult with BVSPC HSM.
LEL Meter (measure at source)	Up to 5% LEL	Continue activities.
	5-10% LEL	Continue: ID source.
	Greater than 10% LEL	Withdraw. Explosion hazard. Consult with BVSPC HSM.
Organic Vapor Detector (PID or FID) (measure in breathing zone) (calibrate for benzene 1:1)	Background	Level D
	Up to 5 ppm above background	Level C. Measure for benzene with Draeger Tube.
	Greater than 5 ppm above background	Withdraw. Consult with BVSPC HSM.
Radiation Meter	Background	Continue activities.
	Greater than background	Withdraw. Consult with BVSPC HSM.
Benzene Draeger Tube	0.1 to 25 ppm	Fullface respirator with organic vapor cartridges.
	Greater than 25 ppm	Level B
Hydrogen Cyanide Draeger Tube Electrochemical Instrument	Any indication	Withdraw. Consult with BVSPC HSM.
Dust Meter	Up to 2 mg/m <sup>3</sup>	Level D, based on dust levels <u>only</u> .
	Greater than 2 mg/m <sup>3</sup>	Level C, based on dust levels <u>only</u> .
Noise Meter	Up to 85 db	Continue activities.
	Greater than 85 db	Hearing protection required.

**Attachment 8**  
**Personnel Decontamination**  
**American Chemical Service, Inc.**

Personnel Decontamination					
Method *	Surface	Action	Technique	Advantages	Disadvantages
Soap and water	Skin and hands	Emulsifies and dissolves contaminate	Wash 2-3 minutes and monitor. Do not wash more than 3-4 times.	Readily available and effective for most radioactive contamination.	Continued washing will defat the skin. Indiscriminate washing of other than affected parts may spread contamination.
Lava soap, soft brush, and water	Skin and hands	Emulsifies, dissolves, and erodes.	Use light pressure with heavy lather. Wash for 2 minutes, 3 times. Rinse and monitor. Use care not to scratch or erode the skin. Apply lanolin or hand cream to prevent chapping	Readily available and effective for most radioactive contamination.	Continued washing will abrade the skin.
Tide or other detergent (plain)	Skin and hands	Emulsifies, dissolves, and erodes	Make into a paste. Use with additional water with a mild scrubbing action. Use care not to erode the skin.	Slightly more effective than washing with soap.	Will defat and abrade skin and must be used with care.
Mixture of 50% Tide and 50% cornmeal	Skin and hands	Emulsifies, dissolves, and erodes.	Make into a paste. Use with additional water with a mild scrubbing action. Use care not to erode the skin.	Slightly more effective than washing with soap.	Will defat and abrade skin and must be used with care.

\* Begin with the first listed method and then proceed step by step to the more severe methods, as necessary.

Area and Material Decontamination					
Method *	Surface	Action	Technique	Advantages	Disadvantages
Vacuum cleaning	Dry surfaces	Removes contaminated dust by suction	Use conventional vacuum technique with efficient filter.	Good on dry, porous surfaces. Ovoids water reactions.	All dust must be filtered out of exhaust. Machine is contaminated.
Water	All nonporous surfaces (metal, painted, plastic, etc.)	Dissolves and erodes	For large surfaces. Hose with high pressure water at an optimum distance of 15 to 20 feet. Spray vertical surfaces at an angle of incidence of 30° to 40°; work from top to bottom to avoid recontamination. Work upwind to avoid spray. Determine cleaning rate experimentally, if possible; otherwise, use a rate of 4 square feet per minute.	All water equipment may be utilized. Allows operation to be carried out from a distance. Contamination may be reduced by 50%. Water equipment may be used for solutions of other decontaminating agents.	Drainage must be controlled. Not suitable for porous materials. Oiled surfaces cannot be decontaminated. Not applicable on dry contaminated surfaces (use vacuum); not applicable on porous surfaces such as wood, concrete, canvas, etc. Spray will be contaminated.
	All surfaces	Dissolves and erodes	For small surfaces - Blot up liquid and handwipe with water and appropriate commercial detergent.	Extremely effective if done immediately after spill and on non-porous surfaces.	Of little value in the decontamination of large areas, longstanding contaminants and porous surfaces.
Detergents	Nonporous surfaces (metal, painted, glass, plastic, etc.)	Emulsifies contaminant and increases wetting power of water and cleaning efficiency of steam	Rub surface 1 minute with a rag moistened with detergent solution then wipe with dry rag; use clean surface of the rag for each application. Use a power rotary brush with pressure feed for more efficient cleaning. Apply solution from a distance with a proportionate pressure. Do not allow solution to drip onto other surface. Mist application is all that is necessary.	Dissolve industrial film and other materials which hold contamination. Contamination may be reduced by 90%.	May require personal contact with surface. May not be efficient on longstanding contamination
Steam	Nonporous surfaces (especially painted or oiled surfaces)	Dissolves and erodes	Work from top to bottom and from upwind. Clean surface at a rate of 4 square feet per minute. The cleaning efficiency of steam will be greatly increased by using detergent.	Contamination may be reduced approximately 90% on painted surfaces.	Stream subject to same limitations as water. Spray hazard makes the wearing of waterproof outfits necessary.

Area and Material Decontamination (Continued)					
Method *	Surface	Action	Technique	Advantages	Disadvantages
Complexing agents	Nonporous surfaces (especially unweathered surfaces; i.e., no rust or calcareous growth)	Forms soluble complexes with contaminated material	Complexing agent solution should contain 3% (by weight) of agent. Spray surface with solution. Keep surface moist 30 minutes by spraying with solution periodically. After 30 minutes, flush material off with water. Complexing agents may be used on vertical and overhead surfaces by adding chemical foam (sodium carbonate or aluminum sulfate).	Holds contamination in solution. Contamination may be reduced by 75% in 4 minutes on unweathered surfaces. Easily stored; carbonates and citrates are nontoxic, noncorrosive.	Requires application for 5 to 30 minutes. Little penetrating power; of small value on weathered surfaces.
Inorganic acids	Metal surfaces (especially with porous deposits; i.e., rust or calcareous growth); circulatory pipe systems	Dissolve porous deposits	Use dip-bath procedure for movable items. Acid should be kept at a concentration of 1 to 2 normal (9 to 18% hydrochloric, 3 to 6% sulfuric acid). Leave on weathered surfaces for 1 hour. Flush surface with water, scrub with a water-detergent solution, and rinse. Leave in pipe circulatory system 2 to 4 hours; flush with plain water, a water-detergent solution, then again with plain water.	Corrosive action on metal and porous deposits. Corrosive action may be moderated by addition of corrosion inhibitors to solution.	Personal hazard. Wear goggles, rubber boots, gloves, and aprons. Good ventilation required because of toxicity and explosive gases. Acid mixtures should not be heated. Possibility of excessive corrosion if used without inhibitors. Sulfuric acid not effective on calcareous deposits.
Organic solvents	Nonporous surfaces (greasy or waxed surfaces, paint or plastic finishes, etc.)	Dissolves organic materials (oil, paint, etc.)	Immerse entire unit in solvent or apply by wiping procedure (see Detergents).	Quick dissolving action. Recovery of solvent possible by distillation	Requires good ventilation and fire precautions. Toxic to personnel. Material bulky.

Area and Material Decontamination (Continued)					
Method *	Surface	Action	Technique	Advantages	Disadvantages
Acid mixtures:  Hydrochloric, sulfuric, acetic, citric acids, acetates, citrates	Nonporous surfaces (especially with porous deposits); circulatory pipe systems	Dissolves porous deposits	Same as for inorganic acids. A typical mixture consist of 0.1 gal. hydrochloric acid, 0.2 lb sodium acetate and 1 gal. water	Contamination may be reduced by 90% in 1 hour (unweathered surfaces). More easily handled than inorganic acid solution.	Weathered surfaces may require prolonged treatment. Same safety precautions as required for inorganic acids.
Caustics:  lye (solidum hydroxide) calcium hydroxide potassium hydroxide	Painted surfaces (horizontal)	Softens paint (harsh method)	Allow paint-remover solution to remain on surface until paint is softened to the point where it may be washed off with water. Remove remaining paint with long-handled scrapers. Typical paint remover solution: 10 gal. water, 4 lb lye, 6 lb. boiler compound, 0.75 lb. cornstarch.	Minimum contact with contaminated surfaces. Easily stored.	Personal hazard (will cause burns). Reaction slow; thus, it is not efficient on vertical or overhead surfaces. Should not be used on aluminum or magnesium.
Trisodium phosphate	Painted surfaces (vertical, overhead)	Softens paint (mild method)	Apply 10% solution by rubbing and wiping procedure (see Detergent)	Contamination may be reduced to tolerance in one or two applications.	Destructive effective on paint. Should not be used on aluminum or magnesium.
Abrasion	Nonporous surfaces	Removes surfaces	Use conventional procedures, such as sanding, filing and chipping; keep surface damp to avoid dust hazard.	Contamination may be reduced to as low a level as desired	Impracticable for porous surfaces because of penetration by moisture
Sandblasting	Nonporous	Removes surfaces	Keep sand wet to lessen dust.	Practical for large surface areas	Contamination spread over area must be removed.
Vacuum blasting	Porous and non-porous surfaces	Removes surface; traps and controls contaminated waste.	Hold tool flush to surface to prevent escape of contamination.	Contaminated waste ready for disposal. Safety abrasion method.	Contamination of equipment.

\* Begin with the first listed method and then proceed step by step to the more severe methods, as necessary.

## Appendix A

### Task Health and Safety Plan A American Chemical Services, Inc. Site

Prepared By: Nicole T. Didyk  
Nicole T. Didyk  
(Project Engineer)

Date: Nov 1, 2005

Reviewed By: Larry M. Campbell  
Larry M. Campbell  
(Project Manager)

Date: 12 Dec 05

Approved By: Jack Schill  
Jack Schill, CIH, CSP  
(BVSPC HSM)

Date: 12 DEC 2005

Expiration Date: 31 DEC 2006

The following Task HASP A contains health and safety information specific to the tasks described within. This Task HASP A is an extension of the Site HASP and as such must be used in conjunction with that document.

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## **A1.0 Scope of Investigative Work**

This Task HASP A shall apply to all BVSPC personnel performing oversight activities at the American Chemical Service, Inc. (ACS) site. The following activities will require oversight:

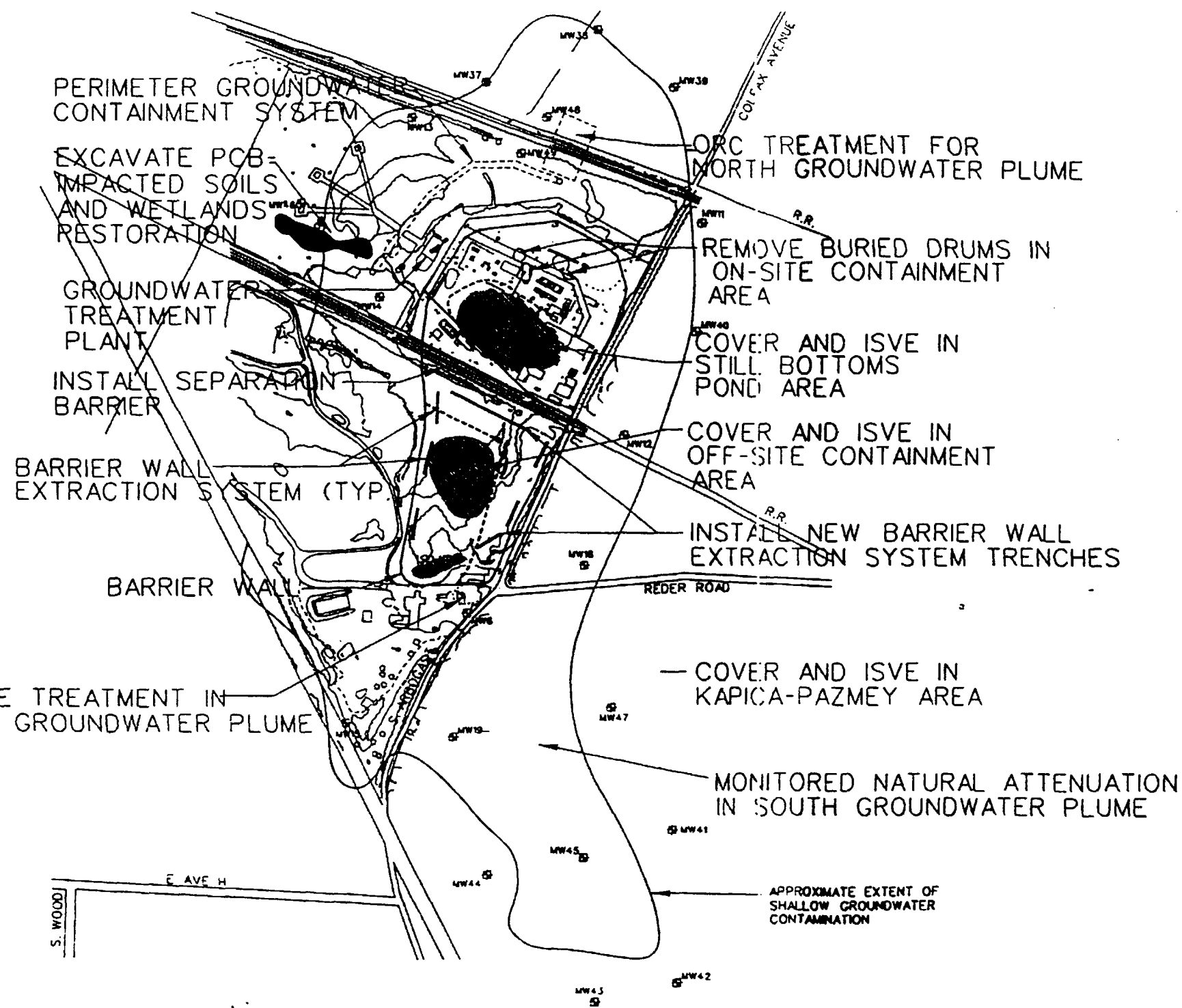
Current site activities are as follows:

- a. Monitoring well and piezometer water level measurements during groundwater sampling.
- b. Chemical oxidation injection technology for testing the source plume.
- c. Sampling of vapor from the insitu SVE system.

Potential future site activity includes the following:

- a. Operate/maintain GWTP - collect and test effluent samples.
- b. Operate SVE systems - collect and test influent and effluent sample.
- c. Measure water levels in monitoring wells, piezometers, and staff gages.
- d. Collect and analyze water samples.
- e. Conduct chemical oxidation inspection and subsequent sampling.
- f. Conduct lower aquifer investigation and groundwater pump test.
- g. Install wells needed to remediate lower aquifer contaminants.
- h. Conduct additional chemical oxidation injections.
- i. Collect product from SVE wells.
- j. Upgrade onsite SVE system.

Figure A-1 is the site plan that shows the specific work areas.



REVISION 201  
 TOWN  
 OUTLINE  
 7/8/01  
 ACAD 14  
 ORIGINAL DWG SIZE 11 x 17  
 CAD DWG NOT CH101576.DWG

SCALE  
 1"=200'



**BLACK & VEATCH**  
 Corporation  
 Chicago, Illinois

ACS RA GROUP  
 AMERICAN CHEMICAL SERVICE SUPERFUND SITE  
 GRIFFITH, INDIANA

100% REMEDIAL DESIGN  
 SITE PLAN

FIGURE  
 A-1

## **A2.0 Site Characteristics**

### **A2.1 Facility Description**

The ACS site is located in the town of Griffith, Lake County, Indiana. Figure A-1 is a site map. Developed land around the site is used for single family residences and industrial purposes. The site is located at and near 420 South Colfax Avenue, Griffith, Indiana, and includes the 19-acre ACS property, the 2-acre Pazmey Corporation property (formerly Kapica Drum, Inc., and now owned by Darija Djurovic), and the 15-acre inactive portion of the Griffith Municipal Landfill.

### **A2.2 Nature and Extent of Hazardous Materials**

Investigation and remedial action activities have been conducted continually at the ACS site since 1989. The investigation activities have indicated the presence of contaminated groundwater, soil, and other sources. Contamination in the surface soils (i.e., primarily PCBs) was observed in the area of the site west of the fire pond (wetlands). Contamination in the surface and subsurface soils (including drums and other source materials) has been observed in the onsite containment area, the offsite containment area, and the still bottoms pond area.

The baseline risk assessment identified the following chemicals of concern in groundwater.

- |                             |                              |
|-----------------------------|------------------------------|
| ● Chloromethane             | ● Bis(2-chloroethyl)ether    |
| ● Vinyl Chloride            | ● 1,4-Dichlorobenzene        |
| ● Methylene Chloride        | ● 4-Methylphenol             |
| ● Acetone                   | ● Isophorone                 |
| ● 1,1-Dichloroethane        | ● Pentachlorophenol          |
| ● 1,2-Dichloroethene (cis-) | ● Bis(2-ethylhexyl)phthalate |
| ● 2-Butanone                | ● PCBs                       |
| ● Trichloroethene           | ● Arsenic                    |
| ● Benzene                   | ● Beryllium                  |
| ● 4-Methyl-2-Pentanone      | ● Manganese                  |
| ● Tetrachloroethene         | ● Thallium                   |
| ● Ethylbenzene              |                              |

However, based on the USEPA approved document titled "Revised Long-Term Groundwater Monitoring Plan, ACS, Inc NPL Site, Griffith, Indiana," dated September 20, 2002, the only chemicals of concern in groundwater are the following:

- Benzene
- Chloroethane
- Bis(2-chloroethyl)ether

The baseline risk assessment identified the following chemicals of concern in soil.

- |                             |                              |
|-----------------------------|------------------------------|
| ● Chloroethane              | ● Bis(2-chloroethyl)ether    |
| ● Vinyl Chloride            | ● 1,4-Dichlorobenzene        |
| ● Methylene Chloride        | ● cPAHs                      |
| ● Acetone                   | ● Isophorone                 |
| ● 1,2-Dichloroethane        | ● Pentachlorophenol          |
| ● 1,2-Dichloroethene (cis-) | ● Bis(2-ethylhexyl)phthalate |
| ● 2-Butanone                | ● PCBs                       |
| ● Trichloroethene           | ● 2,4-Dinitrotoluene         |
| ● Benzene                   | ● Hexachlorobutadiene        |
| ● 4-Methyl-2-Pentanone      | ● Hexachlorobenzene          |
| ● Tetrachloroethene         | ● n-Nitrosodiphenylamine     |
| ● Styrene                   | ● 2,6-Dinitrotoluene         |
| ● 1,1-Dichloroethene        | ● Naphthalene                |
| ● Carbon Tetrachloride      | ● Di-n-butylphthalate        |
| ● Chloroform                | ● 1,2,4-Trichlorobenzene     |
| ● 1,2-Dichloropropane       | ● Aldrin                     |
| ● Toluene                   | ● 4,4,4-DDD                  |
| ● 1,1,1-Trichloroethane     | ● 4,4,4-DDE                  |
| ● 1,1,2,2-Trichloroethane   | ● 4,4,4-DDT                  |
| ● Chlorobenzene             | ● Heptachlor Epoxide         |
| ● Xylene                    | ● Endosulfan I               |
| ● Antimony                  | ● Alpha-BHC                  |
| ● Cadmium                   | ● Gamma-BHC                  |
| ● Chromium                  | ● Beta-BHC                   |
| ● Lead                      |                              |

### 2.3 Summary of Previous Site Activities

ACS began operations in 1955 as a solvent recovery firm. ACS was later involved in chemical manufacturing and operated for a limited time as a Resource Conservation and Recovery Act (RCRA) facility. Several areas of the property were used for disposal of hazardous wastes. In 1990, ACS ceased solvent reclaiming activities after losing interim status under RCRA. Today, ACS operates as a chemical manufacturer.

The USEPA completed a remedial investigation at the site and issued a Record of Decision (ROD) for site cleanup in September 1992. Later, USEPA issued an amended ROD (1999) to change the selected full treatment remedy to a containment and treatment remedy. Subsequently, USEPA reached agreement with the potentially responsible parties (PRPs) who privately have undertaken the cleanup at the ACS site. As obligated by the Consent Decree, the PRPs have or will perform the following tasks:

- Excavated 1,698 drums and drum carcasses from the onsite containment area; characterized drum contents and shipped offsite 234 drums and 380 cubic yards (c.y.) of drum carcass debris for incineration; and relocated 2,500 c.y. of spilled drum contents and contaminated soils to backfill the onsite fire water pond.
- Constructed interim and final covers over the buried waste in both the offsite and K-P areas and over the Still Bottoms Pond Area (including the backfilled fire water pond).
- Implemented insitu soil vapor extraction (SVE) of volatile organic compounds (VOCs) in the buried waste in the onsite containment area, the offsite containment area, and the K-P area.
- Constructed a groundwater extraction and treatment system capable of dewatering the areas of the site targeted for SVE and also containing the offsite groundwater contaminant plume. Treated water is being discharged to the wetlands.
- Excavated soil/sediment containing greater than 1 ppm polychlorinated biphenyls (PCBs) from the wetlands and placed 1,100 c.y. in the fire water pond and an additional 3,800 c.y. in the offsite area beneath the clay covers. Since none of the excavated soil/sediment contained PCBs at concentrations greater than 50 ppm, all could be reused onsite without requiring offsite disposal.
- Installed a subsurface separation barrier (slurry) wall between the offsite and

onsite containment areas to divide the site in half (to aid in dewatering the areas to allow for operation of the SVE).

- Maintained the previously installed subsurface barrier wall around the ACS site to minimize the movement of site contaminants offsite and to impede groundwater flow into the site; pumped groundwater from within the area surrounded by the barrier wall to maintain an inward groundwater gradient across the wall. Onsite contaminant source areas were covered with a soil and asphalt cap, and offsite contaminant source areas were covered with a soil cap and a flexible membrane liner to reduce infiltration.
- Implemented long-term groundwater monitoring, including private well sampling. Impacted wells would be subjected to closure or the owner would receive groundwater use advisories.
- Implemented chemical oxidation injection technology treatments in the source area for the offsite contaminated south area groundwater plume outside the barrier wall.

## **A3.0 Hazard Assessment**

### **A3.1 Hazard Analysis**

Before the beginning of each major phase of work, an activity hazard analysis shall be prepared. A major phase of work is defined as operations involving a type of work presenting hazards not experienced in previous operations or where a new subcontractor or work crew is to perform. A hazard analysis of the task and subsequent steps is presented in Table A-1.

- Description of activity or job task to be performed: Oversight of remedial action activities, including monitoring well and piezometer water level measurements during groundwater sampling; chemical oxidation injection and sampling; and lower aquifer investigation.
- Planned duration of events: 2 years
- Season of activity: 2005 to 2007
- Workday hours: 8 to 12 hours (task-dependent).

### **A3.2 Chemical Hazards**

The USEPA approved document titled "Revised Long-Term Groundwater Monitoring Plan, ACS, Inc NPL Site, Griffith, Indiana," dated September 20, 2002 identified the following chemicals of concern in groundwater.

- Benzene
- Chloroethane
- Bis(2-chloroethyl)ether

The baseline risk assessment identified the following chemicals of concern in soil.

- Chloroethane
- Vinyl Chloride
- Methylene Chloride
- Acetone
- 1,2-Dichloroethane
- 1,2-Dichloroethene (cis-)
- 2-Butanone
- Trichloroethene
- Benzene
- 4-Methyl-2-Pentanone
- Bis(2-chloroethyl)ether
- 1,4-Dichlorobenzene
- cPAHs
- Isophorone
- Pentachlorophenol
- Bis(2-ethylhexyl)phthalate
- PCBs
- 2,4-Dinitrotoluene
- Hexachlorabutadiene
- Hexachlorobenzene



- Tetrachloroethene
- Styrene
- 1,1-Dichloroethene
- Carbon Tetrachloride
- Chloroform
- 1,2-Dichloropropane
- Toluene
- 1,1,1-Trichloroethane
- 1,1,2,2-Trichloroethane
- Chlorobenzene
- Xylene
- Antimony
- Cadmium
- Chromium
- Lead
- n-Nitrosodiphenylamine
- 2,6-Dinitrotoluene
- Naphthalene
- Di—butylphthalate
- 1,2,4-Trichlorobenzene
- Aldrin
- 4,4,4-DDD
- 4,4,4-DDE
- 4,4,4-DDT
- Heptachlor Epoxide
- Endosulfan I
- Alpha-BHC
- Gamma-BHC
- Beta-BHC

### **A3.3 Physiological Hazards**

- Heat/cold stress
- Strains and sprains
- Fatigue
- Cuts

### **A3.4 Physical Hazards**

- Slips, trips, and falls
- Vehicles and traffic
- Heavy equipment operation
- Electrical sources

### **A3.5 Hazards Posed by Onsite Activities**

Potential hazards include chemical exposure to soil cuttings during drilling of soil borings, and chemical exposure from liquid splash contact. Due to the nature of oversight work, the occurrence of these potential hazards is considered remote.

### **A3.6 Overall Hazard Level**

During the performance of the work, the potential for exposure to contaminants by inhalation or direct skin contact, the potential for accidents due to mechanical failure or operator negligence is considered to be low. To minimize hazards, safe work practices will be maintained during all site activities, and BVSPC personnel will stand upwind during these activities.

<p align="center"><b>Table A-1</b> <b>Hazard Analysis</b></p>						
<b>Principle Steps</b>	<b>Potential Safety or Health Hazards</b>	<b>Monitoring Requirements</b>	<b>Action Levels</b>	<b>Personal Protective Equipment</b>	<b>Recommended Controls</b>	<b>Training Requirements</b>
Oversight of monitoring well and piezometer water level measurements during groundwater sampling	Heat/cold stress. Slips, trips, and falls. Vehicles and traffic.	None required.	Not Applicable	Level D.	Stand 10 feet upwind of the monitoring well during sampling; maintain safe work practices.	No modification from Site HASP
Oversight of chemical oxidation injection for testing source plume	Heat/cold stress. Slips, trips, and falls. Vehicles and traffic. Electrical sources.	None required.	In instances where the oversight personnel must stand in close proximity of contaminated soil or groundwater.	Level D. Upgrade to Modified Level D* will occur when appropriate action levels are exceeded.	Stand 10 feet upwind of sampling device during sampling; maintain safe work practices.	No modification from Site HASP
Sampling of Vapor from ISVE system	Exposure to site contaminants Noise Biological hazards Temperature stress Site traffic Slip/trip/fall	Continuously for organic vapors and vinyl chloride.	The MWH HASP action levels are less conservative than the BVSPC Site and Task HASPs, specifically for combustible gas monitoring. Oversight personnel should employ those action levels which provide the greatest degree of safety. Coordination with MWH may be required for various tasks.	Modified Level D * Upgrade to Level D will occur when appropriate action levels are exceeded.  Oversight personnel must evaluate PPE needs based on oversight activities and proximity to site activity.	Maintain safe work practices and distance from the work area. Stand a minimum of 10 feet upwind from the sampling area. Comply with MWH's safety plan.	No modification from Site HASP
Oversight of lower aquifer investigation	Heat/cold stress. Slips, trips, and falls. Vehicles and traffic.	None required.	In instances where the oversight personnel must stand in close proximity of contaminated soil or groundwater.	Level D. Upgrade to Modified Level D* will occur when appropriate action levels are exceeded.	Stand 10 feet upwind of the drilling area during lower aquifer investigation; maintain safe work practices.	No modification from Site HASP

\* Modified Level D is defined in Section 5.0 of the Task HASP A.

## **A4.0 Personnel Qualifications**

The standard qualifications presented in Section 4.0 of the Site HASP apply.

## **A5.0 Personal Protective Equipment**

The required personal protective equipment (PPE) for the different action levels is discussed in Section 5.0 of the Site HASP. The remedial action oversight activities will be conducted in Level D. In instances where the oversight personnel must stand in close proximity to contaminated soil or groundwater, Modified Level D PPE will be donned. Requirements for Level D and Modified Level D, as specified in Section 5.0 of the Site HASP, are summarized below:

- **Level D PPE**
  - Long sleeved work uniform or equivalent.
  - Boots with steel toe and steel shank.
  - Safety glasses with sideshields.
  - Gloves, chemical-resistant (11-mil-thick nitrile) when handling contaminated materials.
  - Hardhat.
- **Modified Level D PPE**
  - Tyvek coveralls with long sleeves or equivalent.
  - Boots with steel toe and steel shank.
  - Safety glasses with sideshields.
  - Outer boot covers, chemical-resistant, disposable.
  - Outer gloves, chemical-resistant (11-mil-thick nitrile).
  - Inner gloves, chemical-resistant (4-mil-thick nitrile).
  - Hardhat.

## **A6.0 Monitoring Program**

The monitoring program for the remedial action oversight activities is described in Section 6.0 of the Site HASP.

## **A7.0 Site Control**

The SSC will define the Exclusion Zone, Contaminant Reduction Zone, and Support Zone before field activities begin at each sampling location. The Exclusion Zone, which will include the task work zone, will be no less than a 10-foot radius from the monitoring well location while sampling is being performed, and no less than a 20-foot radius from the soil boring while drilling is being performed.

When in Level D or Modified Level D PPE, entry into and exit from the Exclusion Zone for all personnel and equipment will be made through the Contamination Reduction Zone. Before exiting to the Support Zone, personnel will decontaminate and remove their equipment.

## **A8.0 Safety and Emergency Procedures**

No changes from the Site HASP.

## **A9.0 Emergency Action Plan**

The local Fire Department will be contacted regarding a potential response to a hazardous waste site emergency. The local Fire Department and emergency phone numbers are included in Attachment 1. In case of emergency, the rally point will be outside the exclusion zone in a location identified by the SSC before site activities begin.



## **A10.0 Team Member Responsibilities**

The BVSPC field team will consist of at least a single representative that will perform the duties of site manager and SSC described in the Site HASP. The buddy system requirements outlined in the Site HASP will be performed using the American Chemical Service, Inc. potentially responsible party contractor personnel.

## A11.0 Certification

All field team members are required to read and familiarize themselves with the contents of this Task HASP A and to document their competency through the entry of a signature and date on the section below. Any changes to the Task HASP A will be made in accordance with Section A12.0, Record of Changes.

By my signature, I certify that:

- I have read,
- I understand and
- I will abide by the Task HASP A for the American Chemical Service, Inc. site.

Printed Name	Signature	Date	Affiliation

## A12.0 Record of Changes

Changes to this Task HASP A must be made on the following form and submitted to the BVSPC Project Manager and HSM for their approval. Field activities related to the potential for exposure to contaminants shall be halted until the Task HASP A has been modified to reflect changed conditions and the BVSPC HSM has reviewed or approved the changes. All field team members who are affected by the changes must initial that they have been apprised of the changes.

Revision Number	Subject	Section/Page	Initials/Date